Devoted to
TEXTILE
CHEMISTRY
BLEACHING
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JLY 3, 1944
LUME 33, No. 14

AMERICAN
DYESTUFF REPORTER

FICIAL PUBLICATION
of the
PROCEEDINGS
ERICAN ASSOCIATION
TEXTILE CHEMISTS
AND COLORISTS

For your ready reference

Geigy has prepared a color card illustrating sixteen

Solophenyl Colors

on Cotton and Spun Rayon in three depths.

This is the first card to illustrate the range of this "Fastest to Light of All Direct Color" series, and embodies properties and other pertinent detail which you will find desirable for your ready reference.

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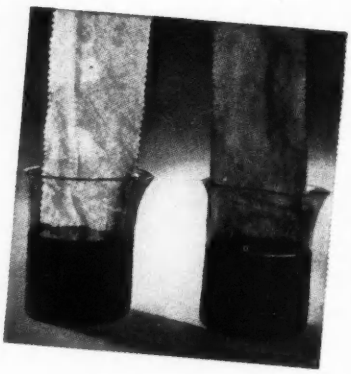

DECERESOL OT has excellent dye levelling properties. "Grey" cotton fabric (left) dyes unevenly. A dye solution containing 0.05% DECERESOL OT 100% (right) produces uniform, level dyeing.

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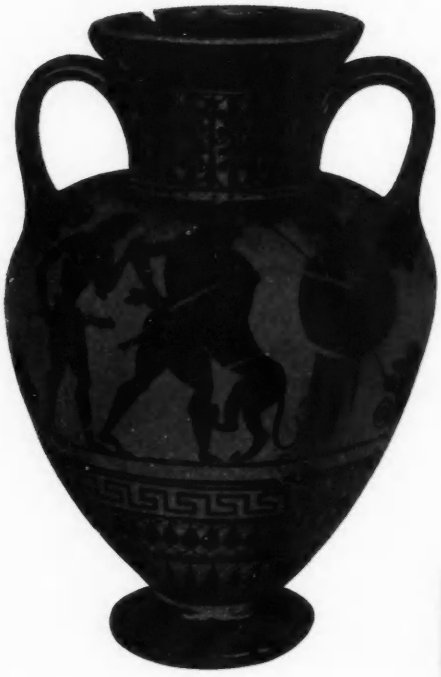

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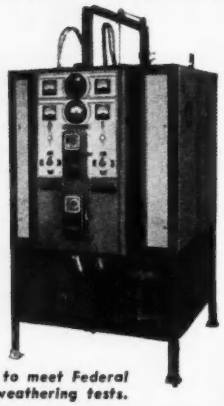

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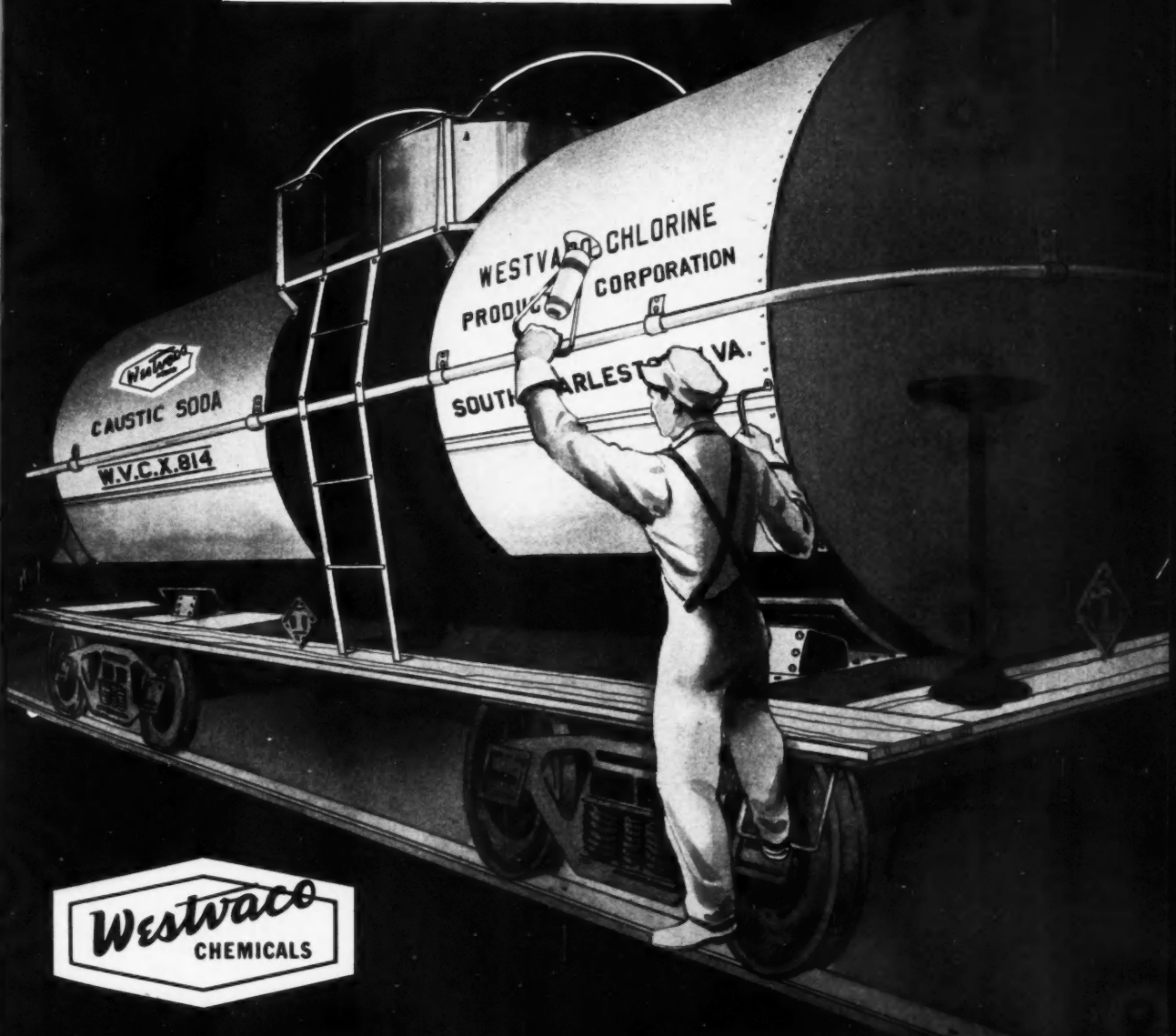

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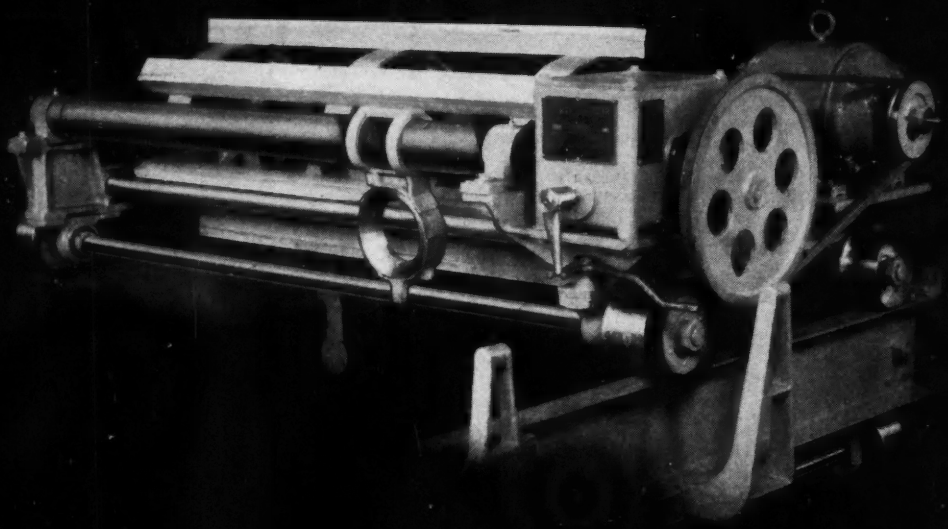

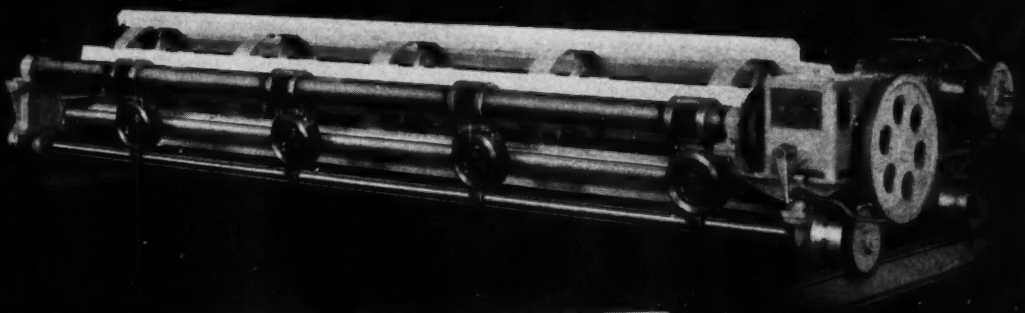

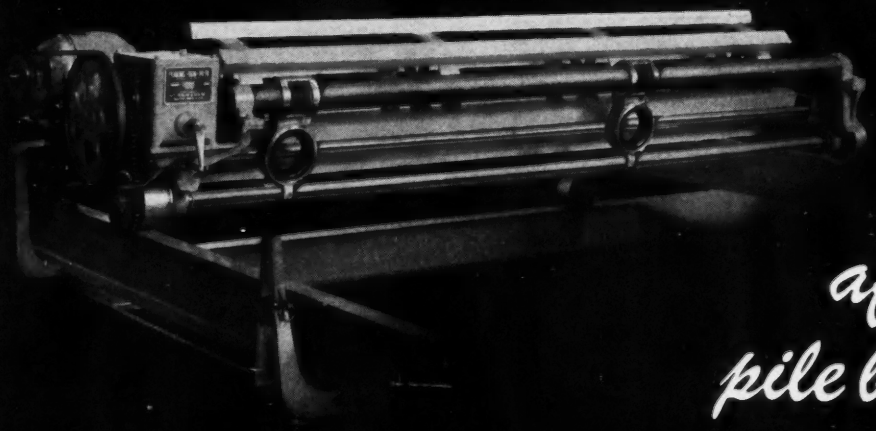

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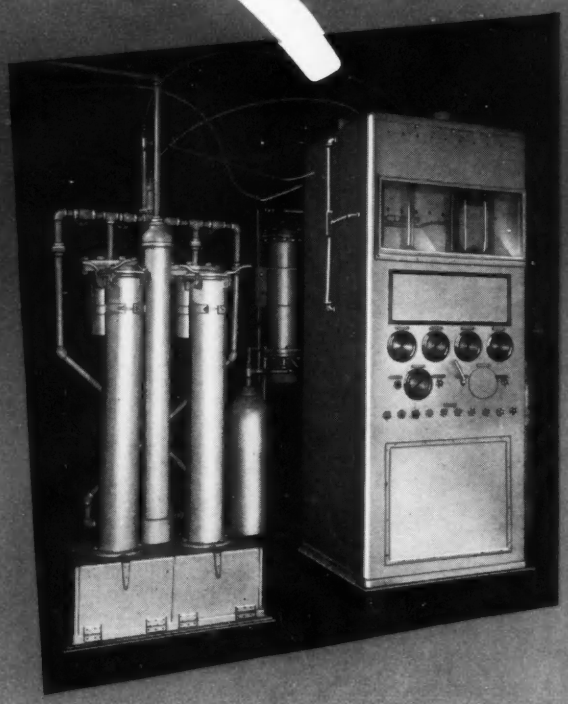

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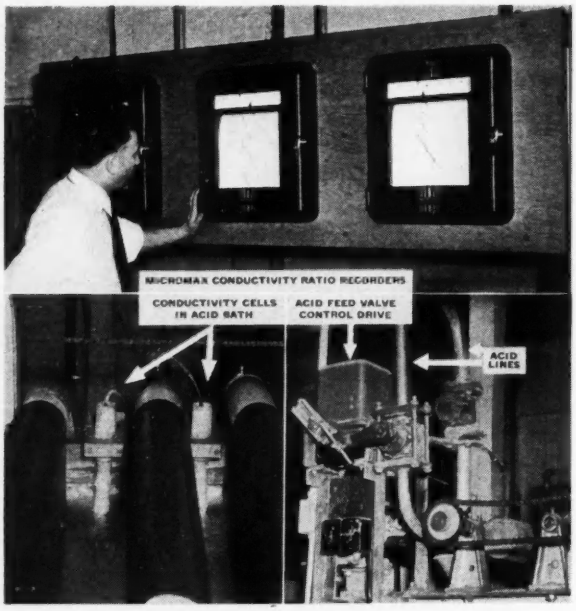

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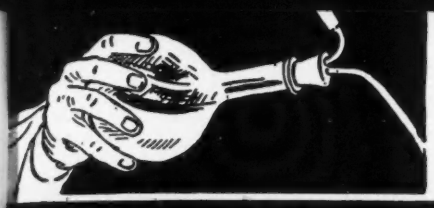

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NATIONAL TECHNICAL SERVICE is founded on the simple truth that no one man can be expected to cope with every conceivable application of dyestuffs on every type of fiber and mixture.

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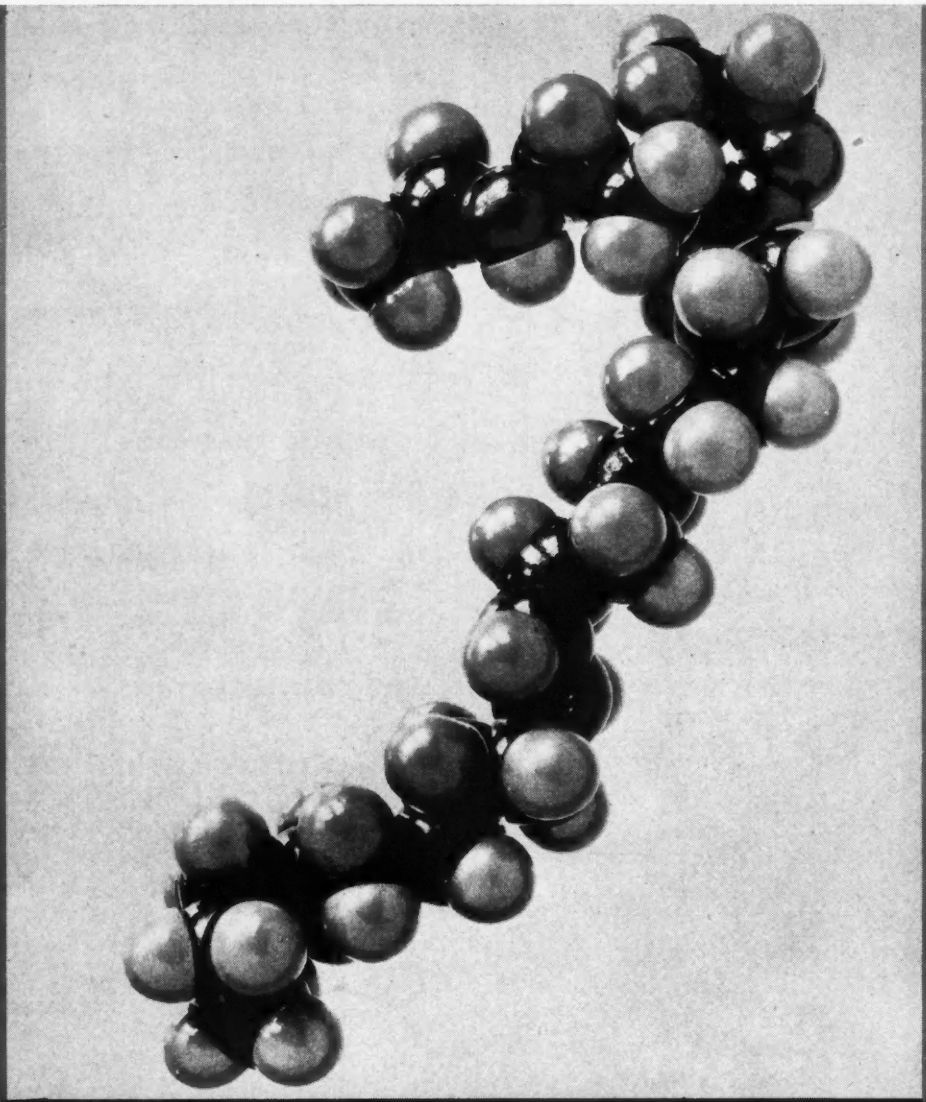

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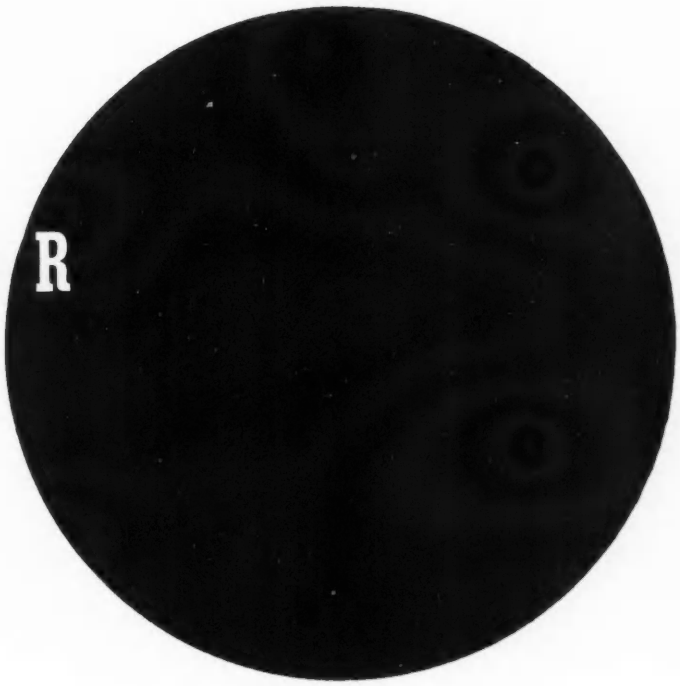
Eastone* Rubine R



Eastone* Rubine R, a distinctive development among rubine dyes, is a straight dyestuff. It can be dyed with equal success at temperatures used for both jig and box work. Low color percentages for pink dyeings have levelness and uniformity of shade. The deep rubine shades have good fastness to crocking. The general commercial fastness properties of Rubine R are satisfactory for its many recommended uses.

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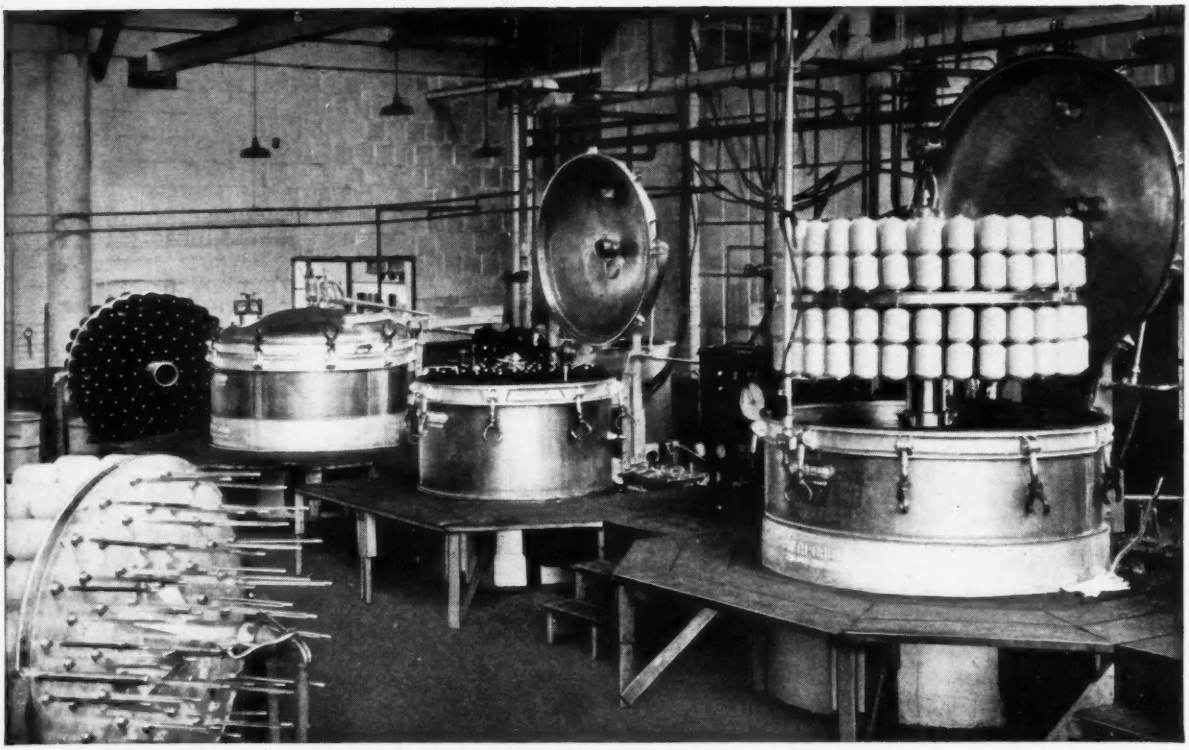

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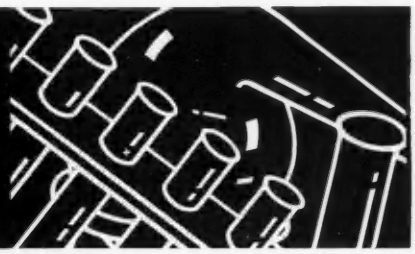

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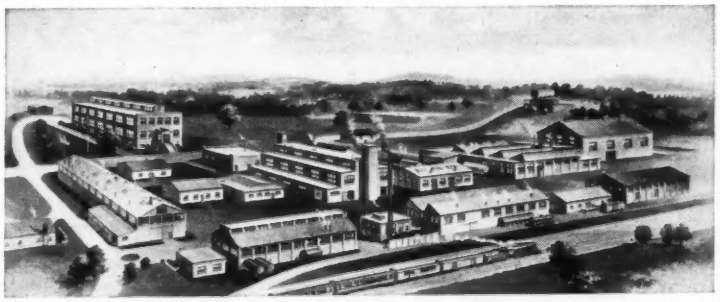

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Official Publication of the Proceedings of the American Association of Textile Chemists and Colorists

JULY 3, 1944

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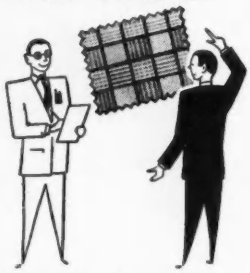
CROSS-DYED RAYON SHEER IS "CROWN" TESTED FOR HIGH-STYLE DRESS AND BLOUSE WEAR

No. 29 of a series—from our files on the new "CROWN" Tested Plan



Here's the story of Hafner Associates' "Sheercheck"... a dress and blouse sheer that's really something to shout about!

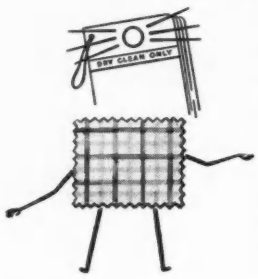
Hafner Associates designed this fabric to be just as serviceable as it is good-looking. They wanted it resistant to perspiration and crocking. They wanted it resistant to fading, stretching and shrinking when dry cleaned. Furthermore, they wanted to prove in advance ... to themselves and to the ultimate consumer ... that it had all these qualities. So ... they chose CROWN* Testing.

Preliminary tests showed that "Sheercheck" was indeed a beautifully constructed fabric. But some of the nine colors, unfortunately, revealed a tendency to streak with perspiration. So at Hafner's own suggestion, a 3-way conference was held. Those present were the manufacturer himself; his finisher, Atlantic Dye Works Co., and our CROWN Tested Department.

At that conference it was decided to make certain revisions in the dye formulas ... to obtain the right shades in each combination, yet at the same time meet CROWN Tested standards. And that decision hit the nail on the head! For the new formulas worked from the very start. All nine colors are CROWN Tested, the first fabric of this type to pass the CROWN Tested requirements.

To appreciate just what that means ... look at these requirements which this fabric (every dye lot of it!) can and does pass:

Colorfastness to dry cleaning	Dry & Wet
Dimensional restorability	2%
Resistance to perspiration	Acid & Alkaline
Resistance to atmospheric fading	AATCC Test
Resistance to crocking	Test B



Now you'll find "Sheercheck" ... in 9 lovely color combinations ... selling under the CROWN Tested Red Tag. This tag tells the consumer DRY CLEAN ONLY ... and it predicts truly satisfactory results when the fabric is cleaned by either wet or dry methods.

Through the CROWN Tested Plan you, too, can measure the stability ... and dramatize the performance ... of your rayon fabrics. That's the way to build consumer confidence for today and tomorrow!

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Here are the facts on this latest CROWN Tested development. The laboratory itself is conveniently located in New York City. Through its facilities, converters and finishers working to meet CROWN Tested standards can obtain accurate dye formulas that meet color specifications. What's more, these formulas are tested for practicability in use ... they're proved under actual plant conditions! So it's easy to see how licensees making use of the Dyestuff Research Laboratory achieve the best possible results ... with the least possible time and effort. May we put this new service to work for you?

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Typically modern is the drapery fabric illustrated here, with its bold overscale design. And typically Schumacher is the inspiring use of color to achieve a focal point of interest in this smart interior. By picking up the mulberry note for the upholstery from among the cool greens, the blues and greys of the drapery pattern, the brilliancy of the print is subdued.

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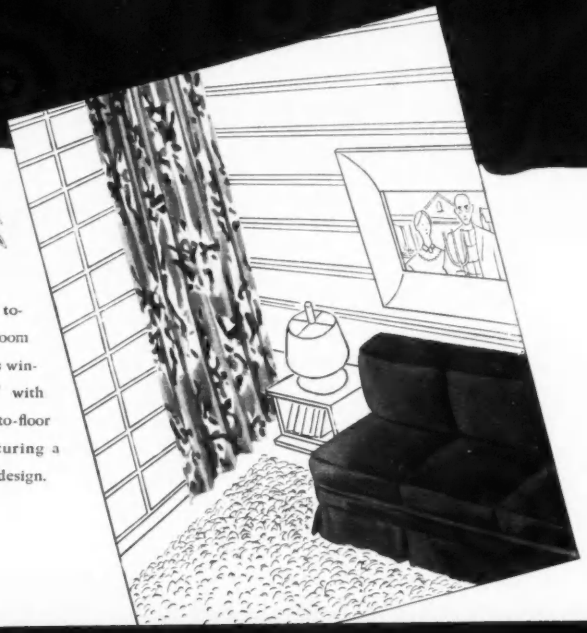

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PATENTS COVERING THE METHOD AND THE CALCOMET DYES HAVE BEEN APPLIED FOR

COLORS BY CALCO

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists

JULY 3, 1944

Discussion Session of the Inter-Society Color Council, March 1, 1944, on SMALL COLOR DIFFERENCES

This meeting co-sponsored by the American Association of Textile Chemists and Colorists and the Federation of Paint and Varnish Production Clubs

(Continued from June 19, 1944, issue)

Chairman Judd: We now will hear from the chairman of the delegates from the Illuminating Engineering Society, Dr. H. P. Gage.

Dr. Gage: When I started in I did not know exactly what form this meeting would take and I prepared a report of the chairman of the delegates to this society on the work of the Illuminating Engineering Society. I think the best way to get over what should be presented this morning is simply to divide this report into two parts and read one portion of it submitted by Norman Macbeth regarding work on a program of very wide cooperation among a large number of people, that relates to data pertinent to the establishment of proper daylight illumination for color matching and the discrimination of small color differences.

Dr. Gage read the following report:

USE OF CONSTANT AND STANDARD ILLUMINANT IMPORTANT IN DISCRIMINATION OF SMALL COLOR DIFFERENCES

NORMAN MACBETH

For the Illuminating Engineering Society

SINCE the beginning of the war, textile mills have been supplying a large portion of their production to the United States Government, and the United States Army Quartermaster Depots. Since such a large volume of material was required, it became necessary to purchase this material from a large number of plants located in various sections of the United States having varying standards of illumination for the detection of small color differences in color matching.

It is commonly known that colors matched under one quality of illumination may be a mismatch under other qualities, therefore a number of interested persons and groups, including the U. S. Department of Agriculture, and the American Association of Textile Chemists & Colorists, have been concerned with specifications for establishing some sort of standard conditions of illumination for color matching. The U. S. Department of Agriculture has done considerable pioneer work, reported in three research papers, one before the Optical Society and two before the Illuminating Engineering Society. The AATCC Research Committee, following a request from the Quartermaster, adopted a standard set of specifications for illumination in color matching in 1942, published in the American Dyestuff Reporter (July 20, 1942). But large textile groups, including the office of the Quartermaster at the Philadelphia Depot, were not entirely satisfied that the 7500° K specification recommended for artificial daylighting use was high enough in color temperature.

There is therefore now in progress a cooperative test in which many of those here this morning are participating (including those who were active in these first studies), the aim being to assemble data on what mill color matchers have, and on what they prefer in natural and artificial daylighting both as regards amount and quality of illumination. Although considerable data have been assembled already for one of the three cooperating mills, it will be several months yet before all the data are ready to compile. Meanwhile, it seems useful for your I.E.S. delegates to point out during these discussions this morning that illumination is an important factor in color matching problems, and to point to current work that may help in setting a specification that color matchers will endorse. We might also report that to date the data show no disagreement with previous work.

* * *

Chairman Judd: This report illustrates in a very striking way how the interests of the various member bodies of the Council dovetail in the matter of small color differences, and we shall await with a good deal of interest the publication of the results of the study which has been described. Perhaps we can get some further preliminary idea of these results from the general discussion which is now about to open. I think we had better plan on closing the session at one o'clock. That will give us forty minutes for general discussion and a summary by the Chairman which I expect to condense from twenty to about two minutes—having already managed to get in a good deal of discussion where I thought it would do the most good!

On the question of small color differences I think that in comments on anything that has been said you can tell the speaker, including the Chairman, what you think of them.

Dr. I. H. Godlove (General Aniline & Film, O.S.A. delegate): As these papers were being read I wrote down so many notes that if I commented upon all of them I would probably take much more than the forty minutes myself.

But Dr. Judd has already commented upon and answered about three of my questions.

I want to comment on the excellent presentation of the first paper. There were two points in that paper that I would like to take a moment to discuss. Dr. Stearns mentioned among the difficulties of color control, the fastness of mixtures, that is, a rating of the fastness of an individual dye does not necessarily indicate the fastness which it has in mixtures. This is a serious difficulty. Fortunately, though, one can make certain simple assumptions to predict some of the variations and the direction of those variations. Dr. Stearns mentioned Indanthrene Yellow G which, although a vat dye, is not so very fast alone but does pretty well in a mixture. If one assumes that because it is yellow dye and absorbs ultra violet in large quantum, that quantum can be passed on to another dye that does not absorb so large a quantum and will decompose that other dye, one comes fairly near to the actual facts; whereas the contrary case would not be true.

The other point I want to discuss is one of the difficulties of the interaction between dyes. For years it has been customary to assume that if two dyes are in fairly good solution and of similar character, they do not react with each other and consequently their absorptions are comparative. You see, if the dyes interact it affects what the dyer calls the levelence, that is, the uniformity of the result, and it makes it extremely difficult to get a particular shade by dyeing according to formulas. It happens that a theory worked out in 1930 predicts many of these things, among them the fact that if any two substances are highly colored they will react not only with other dyes, but they may react with themselves, that is, columnize. Further, this theory predicts that this will happen more with blues and greens than with reds and yellows. I mention this as an example of what one can predict. Although we meet these difficulties, there are means by which we can predict them.

Dr. Judd has already answered several of my questions on the paper of Miss Nickerson. I would like to ask Miss Nickerson, though, just what constitutes fair or good correlation?

Miss Nickerson: Any of the average correlations reported, with the exception of the average for No. 8, I consider good correlation, owing to the nature of the problem. There are so many factors that enter into the measurement that we have not yet eliminated that I consider an R^2as low as 0.20 as fair. Certainly when you get R^2 equal to 0.40 or 0.50 you have good correlation for a thing of this sort.

Dr. Godlove: Perhaps one reason why the Judd formula failed is because it attempts to answer more than the other formulas. It at least attempts to take into consideration the matter of gloss.

One more sort of formula I would like to see tried. We have a good deal of evidence that color space is not necessarily Euclidean. I think it would be interesting, since we now have that excellent report on the Munsell colors, to go through the geometry. We might see how the smoothed Munsell data substantiate an extremely simple sort of geometry in which we assume that the color point of a mixture is on a line joining two color points in Euclidean space, assigning to them the Munsell specifications for the new smoothed data. I believe we have all the data that are necessary to do that.

Niss Nickerson: I think Dr. Adams might answer your comment. His space makes a practical attempt to do that sort of thing.

Chairman Judd: Dr. Adams, do you want to respond to that?

Dr. Elliot Q. Adams (General Electric Company, Nela Park): With the exception that the properties along the different radii seem to be somewhat irrational, the answer might be yes.

Chairman Judd: I have been informed there is a widespread popular demand for a few remarks from Mr. Tener for he has had something to do with testing the camouflage paints that go on textiles. Mr. Tener, would you care to step forward and comment?

Mr. R. F. Tener (National Bureau of Standards): I do not think I have anything particular to say except that we have all these troubles that have been brought up here, and plenty of them. We have been testing camouflage materials for a little over two years and they involve paints as well as textile materials. When we judge the materials for color they are all on textile materials, and the poorest of textile material—osnaburg and burlap. The only thing we can do is to try and set up a color range as the samples come in. We have to lay the samples down anl look at them, and they either "are" or "they are not"—like the Scofield "red light." These are the troubles that we have had all the way through. A method in which we could use the "red light" or the "green light" would be very desirable. But I think it should go farther than that because most of these fellows, when you give them the red light want to know how much the color is off. They may call you on long distance telephone, and it is difficult to explain to them that their color is a little too yellow, a little too dark, a little too light, or a little too this or that. If we could give them some numerical value it certainly would be very desirable. Along with all these troubles we also have a tremendous variation in the basic material. You can buy a bale of burlap or osnaburg and in those bales there will be bolts and rolls of cloth. With a given paint you cannot come out with the same color on any two rolls. Such things as sizing on the materials are also definite items that cause color differences.

As for the paints, we have a type that tends to penetrate the cloth. If it penetrates the cloth the paint will stand up nicely on the surface; if it doesn't penetrate into the cloth, you get an entirely different color.

We have all those things to contend with. The burlap

is probably worse than the osnaburg.

If there were a numerical answer that could be given easily, it would help the supplier as well as those of us who grade the result—it would be of tremendous importance to the people that furnish the paints, process the burlap, process the shrimp nets. I don't know what you could do with measuring color on shrimp nets, for that would be a pretty tough proposition. Have you ever tried any of the shrimp nets?

Miss Nickerson: I think it could be done by backing them up in quantity and measuring a fairly large area.

Mr. Tener: I think that is about all I can say.

Miss Nickerson: You do the job visually?

Mr. Tener: Yes, visually. I have been the red light!

Chairman Judd: Here you have a chance to get at the man at the Bureau of Standards who hangs out the red light. Does any supplier of camouflage paint want to quizz him?

Mr. Appel: Although Mr. Tener is right around the corner from me down there, I want to ask him a question on this "go" and "no go" business, that is, whether these small color differences which may be of the same magnitude differ in objectionableness because of the direction of the color change? This problem in the textile field is not merely a question of how many judd units of color difference there are in the color. Mr. Scofield, I think, spoke of objectionableness in color change in paint because of luster coming into the picture. And Dr. Balinkin spoke of what the man will see, and what he will accept or reject. A man may be trained in color work and may see that one difference is no greater than the other, but one difference may be quite objectionable and the other one much less so. I think that one of our troubles in the textile field always will be that, and I am wondering how much that comes into camouflage colors.

Mr. Tener: I think it comes in quite a bit. It did more in the early days in the camouflage material than it does today. One place that it came in quite prominently was on the first standards used for camouflage materials. On some of those you could go one way, but if you went the other way you almost got an over-lapping of colors. And we find also that this is quite important from the standpoint of the durability for the way some of these colors are tinted you get much greater change in weathering than you do from other colors. Take a light green and if it is on the yellow side of green you will probably have more trouble with durability than if it is what you might call a green green. You see there is more to this from the standpoint of durability than just the matching of colors.

Chairman Judd: Does anyone else want to comment on the difference between perceptibility and acceptability?

Mr. Scofield: I would like to bring up the point Dr. Balinkin was mentioning about a sphere centered on a standard color as representing the area of acceptable color. There seems to be a certain amount of evidence accumulating at least in the paint industry that the area of acceptability unfortunately is not spherical. I am coming more and more to the belief that it comes back to our relationship between the normal or expected differences and abnormal or unexpected differences; that is, we tolerate color differences normal for a particular material much more readily than we tolerate differences in what seem to be abnormal directions. In evaluating fading, for example, we are open ordinarily to quite a lot of change in lightness and some change in chroma, but change in hue is extremely objectionable, even small amounts. Another example is that we expect our white paints to be somewhat yellow, for they are made with vehicles that are not white. So we tolerate considerable deviation from white in the yellowish or red directions. But white paints which are at all blue are a very definite indication that monkey business has been afoot, and not so much change in this direction is acceptable.

Chairman Judd: I think I have noticed myself that deviations in lightness and saturation tend to be acceptable because they indicate merely too much or too little of the right thing, but deviations in hue are objectionable because they indicate you have some thing that doesn't belong there.

Are there any other comments?

Dr. Balinkin: Along the same lines I would like to add that in ceramic tiles where you would have variation in lightness, if the two tiles are mounted entirely apart the lightness difference decreases. The same is true about saturation, that is, if you bring two tiles together and they differ in lightness, you can perceive that difference very distinctly. However, if those two tiles are separated, then the perception of color difference, if that difference is in lightness and partly in saturation, is not as perceptible as the differences in hue. That is, when you have two samples together you can see the differences in hue, and when you take them apart that hue difference is still of the same visual magnitude.

My second remark has to do with the non-uniformity or the irregularity in our perception depending upon the direction in which color change takes place, the question of whether it is a sphere or whether it is a spheroid or some other irregular figures. As far as tiles are concerned it really doesn't make any difference. But as far as other products are concerned, a difference does exist. For example, if you have a light yellow standard for butter, the deviation toward red will be acceptable; the same numerical deviation toward green certainly will not be acceptable. And that applies to many other products in the same way. But in certain industries we do not have to worry about the direction of differences; I believe ceramic tile is one of them.

Dr. Godlove: I would like to speak on the point we have been discussing. I can quite agree with Mr. Scofield that the difference may be judged as normal and abnormal according to past training. Past training may explain some of the differences he spoke about, and I say this for several reasons, among them the fact that many years ago I had

a series of samples judged for color differences by two groups, a group of art students and a group of textile colorists. The result led to the conclusion that training has a lot to do with the judgment of the relative magnitude of the differences in chromaticity, particularly hue and Munsell value. The art students were used to judging value differences in painting, and in these studies they weighted value differences heavily. The textile colorists, as one might expect, weighted the hue differences heavily. And I am inclined to believe that training is one of the chief reasons for this difference.

I should add that quite an elaborate study was made in England recently by a textile colorist group who found as I did also myself in some other studies that the judgment of color differences is composite. You frequently find two groups, one group weighting one attribute more, the other group weighting another attribute more.

Lieutenant Andrews (Philadelphia Navy Yard): I would like to add to what Mr. Scofield has said about paints. In our work we are concerned mainly with paint specifications for the Bureau of Ships, and we have a slightly different problem in that we ask in most cases for mandatory formulas. It would seem therefore that we wouldn't have to worry about colors at all because all the manufacturer would have to do is follow formulas to the letter and he could come out with the right color. Unfortunately it isn't that simple, due to differences in dispersion and contamination and what not. We have attempted to specify color by putting limits on gloss, limits on brightness, and by furnishing standard color chips which we say shall be acceptable en masse. That is where the whole thing falls down because we have not too good a definition of what is an acceptable match. I think in our work we could utilize some numerical value for determining color and be a lot closer to obtaining acceptance from the producer than in the case where paint is specified by performance only and the constituents may vary all over the map. Certainly if the constituent pigments are held constant as to type we should get approximately the same reflectance values at the various wave lengths. I bring this up as a slightly different viewpoint.

Another thing, I would like to refer to the question that Dr. Godlove asked Miss Nickerson in regard to the correlation coefficients. How many colors were in each set of colors, Miss Nickerson?

Miss Nickerson: We used the series of nine camouflage colors and had from 15 to 28 samples in each set.

Lieutenant Andrews: The number of colors varied within the set?

Miss Nickerson: Yes.

Lieutenant Andrews: Then the level of the significance of the correlation coefficients would not be the same?

Miss Nickerson: Oh, no! These correlation results are presented in order to provide a general comparison for performance of the different formulas. Results for each formula included the same number of samples for each test but the number of samples of each color varied according to the number we had available.

Lieutenant Andrews: I was wondering if you had any level of significance, one hundred or one part in ten or what.

Miss Nickerson: I had not thought of interpreting the figures rigorously. It surprised me to get averages of $R^2 = .54$ to .60, considering the pioneer state of the subject.

Lieutenant Andrews: I can't quite get straightened out in my own mind in regard to the significance of those figures. If we had twenty colors in one case and ten in another and the same correlation coefficient, certainly there the same correlation coefficient from the higher number of colors would be less significant.

Miss Nickerson: True. But you see I paid little attention to individual correlation figures. That the average results for the nine series came out as high as $R^2 = .54$ and .60 was the fact that interested me. I do not think that statistical interpretations should be too closely applied at the present stage of this work. Rigorous interpretation should not be attempted until we have formulas and measurements that satisfy us as a closer approximation to the final answer than we have today. By the way, the research on which this is based is being reported in detail and will be published in the Journal of the Optical Society. Dr. Balinkin has a copy of the research paper with him and you may see the detailed tables if you wish.

Dr. Adams: I think you would find out that the final probability of the average figure won't be greatly changed by a factor of less then two. If you are drawing conclusions from any one figure that would be serious.

Dr. Ellis Freeman (American Optical Company): I am troubled as I hear the discussion by a question that may not have disturbed others of you because you know color technology and the eye, and I only know the eye. I noticed that no mention was made at all of the possible variations in the trichromatic consciousness of the observer. It is assumed that the observer has a standard eye, but even a standard eye will vary or a person that can be said to have a standard eye will vary within the distribution of sensitivity to any one of the primaries. I wonder how that would effect the response to small color differences. Dr. Stearns, I think, wouldn't find this much of a problem because he dealt with small color differences between textiles and presumably began with samples very close together. On the other hand, I think that with Mr. Scofield the problem might be genuine because there the paints change considerably in hue and consequently entail a different kind of response to the primaries in accordance with the observer. What account is taken of that? I don't suppose it would be practical, but still it wouldn't be any more impractical than having a machine with a "red light" and with a "green light."

Chairman Judd: Is your question addressed to Mr. Scofield?

Dr. Freeman: To anyone that wishes to answer it.

Mr. Scofield: I think that there are two departments there. Two of those investigations which I spoke of represented deliberate attempts to compare pigments of widely different character, that is, formulations made to give a visual match but with entirely different types of pigment, with the ensuing probability of very different spectral distribution curves of the samples. However, as a commercial practice most paint manufacturers endeavoring to match a final color will come very close to using the same materials, and even where there is a change in hue it will be found to represent a slight shift in the position of the spectral reflection curve and not a change in its character. Of course the other extreme is reached in the type of material of which Lieutenant Andrews spoke where the formula is mandatory and the color differences you get are entirely due to slight differences in dispersion, contamination, or differences in your raw materials within the limits in which they are specified. I think in those cases the problem is closely analogous to that in the textile industry. But there are a number of cases of the type which Dr. Freeman mentioned which add confusion and reduce the size of the correlation coefficient.

Another fact that everybody has very kindly passed over, but which might be mentioned is the fact that if you hand two people a can of paint and ask them to prepare a sample from it, there is reasonable probability that the samples won't be a match. The method of preparation of the sample, age, time of drying, conditions under which it dried and also, I regret to say, the amount of stirring which is given the can of paint, all influence the final color. That they just confuse the issue is a fair way of saying it.

Chairman Judd: It has been suggested that I call on Mr. Mattiello, president of the Federation of Paint & Varnish Production Clubs, for any comments that he might have on the general course of events.

Dr. J. J. Mattiello: I am in a sufficient state of confusion as it is.

Chairman Judd: Perhaps there are still some other people who think they can think clearly and have something to say.

Dr. William Churchill (delegate from the American Artists Profesional League): Mr. Chairman, did you want me to say a few words from the standpoint of the Artists' League? Since I am on my feet I might say that Mr. Conrow, the Chairman of delegates from the Artists' League, is in the south at the present time and asked me if I woud see that at least there was someone to represent the association because he feels that it is an important matter that the artists should keep in touch with what is going on in the Inter-Society Color Council. And of course as you realize this particular question is one that does come very close to the heart of the artist. He has some very real problems as any of them will tell you apart from the question of how to make a few dollars. He has some real technical problems and some of them, I think, are of very distinct interest to the scientist and conversely I think the scientist can contribute a great deal to the artist. But this isn't the time to bring those matters up. Today, this isn't a subject that would bring much of a turnout or artists, but when they are discussing a color system like the matter of the paper at the Optical Society tomorrow, that is something again that the artist very much wants to hear about.

I believe Dr. Godlove is responsible for a historical survey of matters pertaining to color that has been coming out in the Inter-Society bulletin. Is that right? That to me, speaking from long years of interest in the subject, is a most fascinating contribution and I hope that it will be available in some form so that the artist as well as others may get the benefit of it.

Chairman Judd: I am sure Dr. Godlove will be gratified that his work in the history of color has attracted the favorable attention of artists. That is, however, somewhat off the subject.

Dr. Adams: In regard to Dr. Freeman's question of the physiological difference or psychological difference between the observers, after all any statistically significant difference in the results of the two observers of the same sample must be due to that, and it might be worth while to point out that there are only two kinds of difference which are not always distinguished. It is possible to have two observers with identical trichromatic distribution coefficients so that any samples that match one would be a match for the other regardless of variations in spectral composition and yet they might assess differences of the samples in different directions quite differently. For example, take the extreme case; a color-blind observer will obviously assess a very low score to certain types of difference. On the other hand, you may have observers of equal sensitivity whose distribution coefficients differ sufficiently for one cause or another so that as soon as you get colors of different absorption distribution they won't check each other's matches. It seems to me that in working with camouflage paints, I would expect to run into that sort of thing. But in any case, as I see it, part of the purpose of the statistical studies on the various formulas was to see whether those differences were great enough to make the calculation from spectrophotometric data of practical value.

Dr. Balinkin: There is one question I would like to ask Miss Nickerson. What is the self-correlation of the same observer? Does anyone have any data? I don't know that self-correlation is a proper term. What I mean by that: you are given twenty-five samples; you have to sort them into six groups according to acceptability or noticeability of color differences. Assuming that you take the same observer one week later and ask him to perform the same task, what will be his self-correlation as I would call it?

Dr. Forrest L. Dimmick (chairman of delegates from the American Psychological Association): That will

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depend largely on his training. If you take untrained observers you will find very often a very low correlation from one set of judgements to the next. But if you take that same observer and give him training in that particular type of judgement, you may reduce his variation from one set of judgements to another to a very small figure.

Dr. Louise Sloan Rowland (delegate from the American Psychological Association): You can't expect higher correlation between the formulas and results than you can between the observer and his performance on a certain day.

Miss Nickerson: We ran several hundred correlations to do this work, yet ran no self-correlation! However, of two observers whose tests were duplicated, the result was good for one, poor for the other. And since these data have been otherwise so carefully examined I have in mind asking our first ten observers to make a second set of observations so that we can run self-correlations.

Mr. C. R. Conquergood (Canada Printing Ink Company, Toronto, Canada): I want to ask Dr. Stearns if there is another dimension that has been considered in these visual examinations, the time factor. I understood Dr. Stearns to say that he put the observer six feet from the sample to be observed. Was there a time limit? My experience is that the same observer will see things differently between say a half second and two minutes.

Dr. Stearns: There was no time factor set. Some men like to make a judgement of a color difference very quickly, they believe that their first estimate is the best. Others like to study the difference over rather a long period of time, a matter of maybe a minute, before they finally come to a decision. In this test to which I had reference there was no time limit.

Chairman Judd: Dr. Freeman, did you have a comment to make?

Dr. Freeman: I don't know about the correlation of these matches to determine small differences, but about twelve years ago I did some colorimetry with seventy-six medical students and got some trichromatic functions, the data at different times running over the course of months for each one. As I recall it, I don't think that any individual differed by 10% on the amount he needed for each of the trichromatic colors to make a bipartite field match.

Chairman Judd: I believe you are right that settings of three primaries to match an unknown can be reproduced by an observer very satisfactorily over a period of months. But this is a case of not whether he makes a match but whether he assesses the given color differences the same from day to day. And I, too, can report an experience. I have studied arrangements according to whiteness for thirty very near white papers and I found that the self-correlation of observers ran very high, a correlation coefficient of about 0.9 which would correspond to R^2 equal to 0.81.

I think probably I ought to take my two minutes now to summarize what remains to be done. The thing that struck me is that Miss Nickerson's studies of the individual's judgement of what passes and what does not pass correlated with instrumental measurements, reduced in accord with the various formulas proposed for color difference, has been so apt a nucleus around which to center this discussion. Perhaps some of you may have gotten the impression that this study of the formulas is a definite and final thing. I believe that the best summary I can make is to reiterate Miss Nickerson's own conclusion that we need an almost immeasurable further amount of such checking before we can say whether a formula represents the judgements of differences by an average observer to the same degree as that observer will agree with himself. It seems to me, however, that the method that has been chosen by Miss Nickerson is quite fruitful and should be pursued.

The difference between perceptibility and acceptability is an important one. I think that we must accept that limitation although already we are able to overcome it to some extent by weighting the several factors in any small difference formula by amounts that will meet the required restrictions regarding acceptability. General formulas relate to perceptibility, but special adjustments of the constants in those same formulas may allow them to relate to acceptibility.

The question of gloss differences in addition to hue, saturation and light differences is, I think, is a real one, yet we still do not know whether it is fruitful to consider gloss as the fourth attribute of color. This again points the way to future study.

From the standpoint of what is practical, I am afraid that I could not give good advice to anyone faced with a particular practical problem about color tolerances. We can only hope that the various points of view which have been represented here this morning from the various national societies that are member bodies of the Inter-Society Color Council will permit one to gain from the experience of the other, thus leading to some improvement in practical methods of applying color tolerances.

I think that ends this session. (Applause)

The meeting then adjourned.

CALENDAR OF COMING EVENTS

Meeting, Southeastern Section, Callaway Institute, La Grange, Ga., September 9, 1944.

Annual Meeting, Hotel Claridge, Atlantic City, N. J., October 12, 13 and 14, 1944. Auspices of Philadelphia Section. Further details will appear in the near future.

Note: Secretaries of local sections are requested to advise the AMERICAN DYESTUFF REPORTER of meeting dates for the 1944-45 season as soon as available.

Procedure and Equipment for BLEACHING COTTON GOODS with Peroxide by the Continuous Method*

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THERE have been many attempts to develop a continuous method for bleaching cotton goods with the objective of decreasing the processing time and the amount of handling. The development of the Gant piler, now in general use for such operations as souring and chemicking, was a definite step toward this objective. However, hypochlorite bleaching remained as a semi-continuous process because of the necessity for kier boiling the material in batches for relatively long periods of time. At least one attempt[2] was made to devise apparatus for the continuous treatment of cotton goods under pressure, but it appears to have attained little or no practical application in the bleaching industry.

In discussing methods for bleaching with peroxides, Weber[4] states that in 1888 Koechlin described a procedure for bleaching cotton goods by passing them through a weak sulfuric acid solution, washing, and then passing through a 2.4 volume hydrogen peroxide solution made alkaline by the addition of caustic soda and sodium silicate. The bath was kept at room temperature and, after saturating, the material was stored at room temperature for a sufficient time for bleaching to take place. Thus, at this early date, it appears to have been established that cotton materials could be bleached by saturating with a suitable peroxide solution and ageing the wetted goods. In some respects this is the forerunner of the present day continuous processes and of other methods that have been suggested since that time.

At a later date the same worker, Koechlin, is cited[4] as suggesting a method for kier bleaching cotton goods with peroxide under 2-3 atmospheres pressure. Since then many other methods have been suggested, e.g., a method of saturating with peroxide and running into a room filled with ammonia vapors[1]; a method of saturating with peroxide and passing continuously through a pressure chamber[5]; a method of saturating with hot or cold peroxide solution and storing in a tightly packed container in the presence of the hot solution or by tightly rolling the heated cloth[3].

In spite of the wealth of art directed toward continuous operation, no practical process had been evolved up to 1937. In that year a continuous process developed in du Pont laboratories was taken into the field for demonstration. Known methods and equipment were adopted, modified[6, 7, 8] and improved to meet the conditions necessary to produce commercially satisfactory results. By June, 1939, plant scale equipment had been built and a suitable procedure developed. Many obstacles remained to be overcome before the original methods and equipment could be developed to a point where consistent results and smooth operation were obtained on a regular production schedule. This goal was eventually reached by virtue of the patient tolerance of the plants where the first full scale installations were made.

The progress of the development has been described to the industry on several occasions[9, 10, 11]. Rupp[12] has compared the du Pont process with another process developed by the Buffalo Electro-Chemical Company. The purpose of the present paper is to report on the status of the du Pont development and to describe the process and equipment involved.

THE BASIC PROCESS FOR PLAIN GOODS

Cotton fabrics may be processed in either rope or open width form. While the equipment differs for the two forms, the nature of the treatments is the same.

The basic process consists of two steps, the first a preliminary scour or 'boil' to prepare the goods for the second or final bleaching step. The method of handling the goods is essentially the same for both steps and consists of three operations.

1. Saturation. The cloth must be uniformly impregnated with approximately its own weight of treating solution.

2. Heating. The cloth is contacted with steam or a steam-air mixture in a controlled manner to heat to the required temperature.

3. Storage. The heated cloth must be stored in an insulated storage chamber for the required reaction period, e.g., one hour.

In the treatment of plain goods, i.e., those which do not contain dyed patterns, the first step is a treatment with caustic soda. Fig. 1 shows the times required to render 80 x 80 cotton print cloth absorbent when heated to 212°F. and stored at that temperature after saturation with caustic soda solutions of different concentrations.

In determining the data for Fig. 1, samples of cloth were given a preliminary treatment by boiling for 15 minutes in water, then saturated in the various solutions and squeezed so they contain about their own weight of solution, heated and stored for different periods. After treating, the samples were thoroughly washed, dried, and ironed. Absorbency was determined by measuring the time required for absorption of a drop of water placed on the surface of the fabric. The surface of the fabric was kept taut by holding the fabric in a form. If the drop was absorbed in three seconds or less, the sample was considered absorbent; several check tests were made on different parts of each sample.

As indicated in Fig. 1, the times vary from 15 minutes to 2 hours with 7 per cent and 2 per cent caustic solutions, respectively. The time required rises sharply with concentrations below 3 per cent and decreases relatively slowly with higher concentrations. It must be borne in mind that the values obtained will vary with the construction of the fabrics, in that more densely woven materials will require longer treatment. Any preliminary treatments such as desizing, souring or mercerizing will also alter the results.

These data were developed in the laboratory, but they have been confirmed by plant work. It has been customary to use a storage period of about one hour to permit the handling of a variety of materials with a reasonably low concentration of caustic soda. The data indicate that this time might be shortened by using a higher concentration, but the consumption of caustic would be greater and there is some possibility of degrad-

*Presented at meeting, Rhode Island Section, March 31, 1944.

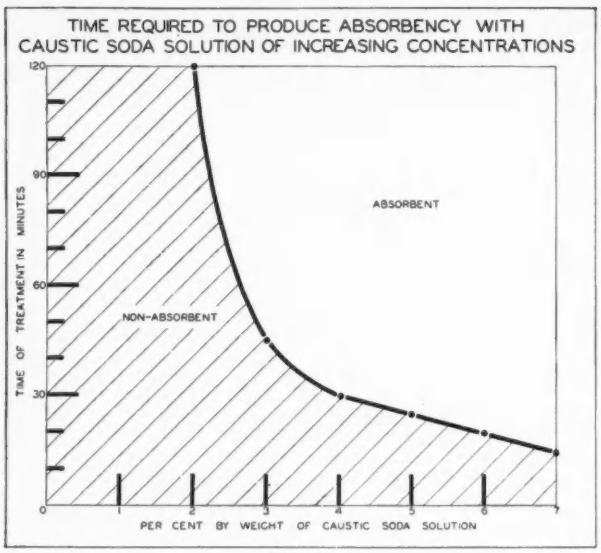

Fig. 1

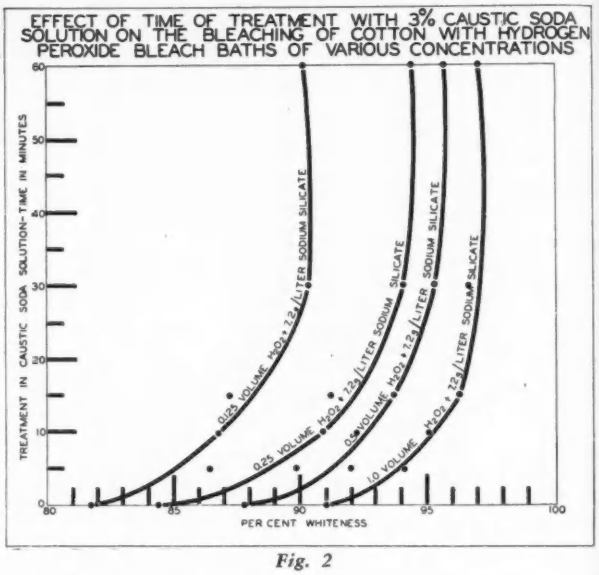
EFFECT OF TIME OF TREATMENT WITH 3% CAUSTIC SODA SOLUTION ON THE BLEACHING OF COTTON WITH HYDROGEN PEROXIDE BLEACH BATHS OF VARIOUS CONCENTRATIONS
TREATMENT IN CAUSTIC SODA SOLUTION-TIME IN MINUTES
60
50
40
30
20
10
0
0.125 VOLUME H2O2 + 1.2 g/LITER SODIUM SILICATE
0.25 VOLUME H2O2 + 1.2 g/LITER SODIUM SILICATE
0.5 VOLUME H2O2 + 1.2 g/LITER SODIUM SILICATE
1.0 VOLUME H2O2 + 1.2 g/LITER SODIUM SILICATE
80
85
90
95
100
PER CENT WHITENESS

Fig. 2

ation. A 3 per cent solution is usually used, although this may vary from 2.5-4.0 per cent depending upon circumstances. As would be expected, it is desirable to avoid operating conditions on the steep slope of the curve. If the cloth is saturated with its own weight of a 3 per cent solution, the consumption is three pounds of caustic soda for one hundred pounds of material. It is interesting to note that this is in good agreement with the amounts usually employed in kier boiling. The time required is less, but this is due to the continuous method in which each yard of material receives the same treatment. In kier boiling, equilibrium may be reached in a relatively short time under ideal conditions but much longer times are needed to insure uniformity throughout the large mass of goods handled in the kier.

After the caustic treatment, the material must be well washed with hot or cold water to remove residual caustic and solubilized impurities from the cotton. The use of apparatus on the delivery end of the storage chamber, similar to the recuperator on a mercerizing range, has some advantages. The treated cloth is not chilled by contact with the atmosphere and the alternate passages through steam and hot water are effective. In cases where the available washing equipment is limited, a neutralizing treatment in which the cloth is treated with a dilute acid may be employed. It is desirable to wash the treated fabric until the pH of the absorbed water is between pH 4.0-10.0 so that the pH of the peroxide bleach bath used in the bleaching step will not be affected substantially.

The effect of peroxide bleach baths ranging from 0.125 to 1.0 volume concentration on 80 x 80 cotton print cloth, previously prepared by boiling for 15 minutes in water and then treating with a 3 per cent solution of caustic soda for periods up to one hour, is shown in Fig. 2. The bleaching treatments were all continued for one hour and the whiteness was determined with a reflectance meter. The whiteness increases with rising volume concentration of peroxide, but in each case the whiteness obtained on samples treated for 30 minutes in caustic soda was approximately the same as when the caustic treatment lasted for 60 minutes.

However, whiteness is not the only measure of good bleaching, since the material must also be absorbent and free of motes. The data in Fig. 2 are replotted in Fig. 3 and, in addition, two broken lines have been included. These are lines of absorbency and mote removal; the samples above and to the right of these lines are absorbent or free of motes, respectively. Absorbency was determined as previously described; mote removal was determined by visual examination. In Fig. 1 it is shown that a 45 minute treatment is needed to produce absorbency with a 3 per cent solution. After bleaching with 0.5 and 1.0 volume peroxide baths, as indicated in Fig 3, the samples treated for only 5 minutes in 3 per cent caustic are absorbent. With more dilute peroxide baths, a 10 minute caustic treatment produces absorbency. Thus it is shown that the bleaching treatment helps in obtaining absorbency. Mote removal is complete on all samples treated with caustic soda and bleached with one volume peroxide solution, but when 0.5 volume peroxide is used, only the sample receiving the one hour caustic treatment is free of motes.

The data plotted were developed in the laboratory but they have been confirmed by plant work. Here again it must be borne in mind that fabric construction has an important bearing on the values obtained. Plant work has shown that with many fabrics good results are obtained with 0.5 volume baths after an hour's caustic treatment but with fabrics more difficult to bleach this must be raised to 0.75-1.0 volume. The temperature of the cloth during storage should be 205°-210°F.; plant work indicates that best results are obtained in this range. The pH of the saturating bath is maintained in the range 10.5-10.8, using about 1 per cent 42°Be. sodium silicate as stabilizing and buffering agent. In some instances it is necessary to add caustic soda to the solution to keep the bath at the proper pH, but this depends largely on the previous treatments.

THE BASIC PROCESS FOR DYED YARN GOODS

The basic process for fabrics containing dyed patterns is also a two-step process. However, since the dyes might be attacked by caustic the preliminary caustic soda treatment is replaced by a preliminary peroxide bleach, similar to the second stage peroxide treatment just described. The concentration of the saturating bath will vary from 0.5 to 1.0 volume; in most cases a 0.5 volume is sufficient to clean up the fabrics and

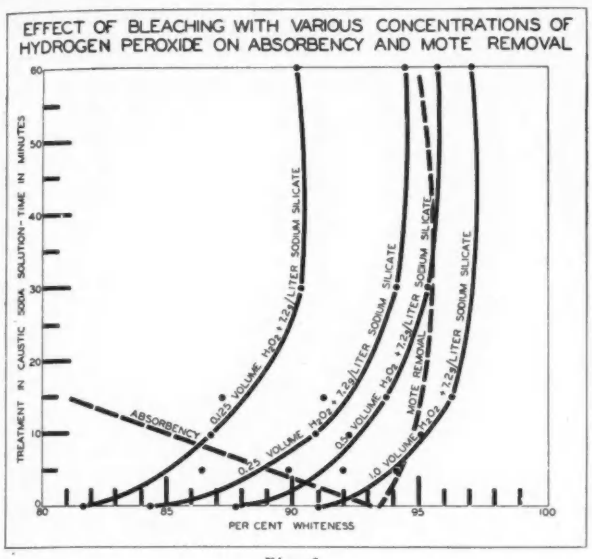
EFFECT OF BLEACHING WITH VARIOUS CONCENTRATIONS OF HYDROGEN PEROXIDE ON ABSORBENCY AND MOTE REMOVAL
TREATMENT IN CAUSTIC SODA SOLUTION - TIME IN MINUTES
PER CENT WHITENESS
ABSORBENCY
MOTE REMOVAL
0.25 VOLUME H2O2 + 7.2g/LITER SODIUM SILICATE
0.5 VOLUME H2O2 + 7.2g/LITER SODIUM SILICATE
1.0 VOLUME H2O2 + 7.2g/LITER SODIUM SILICATE

Fig. 3

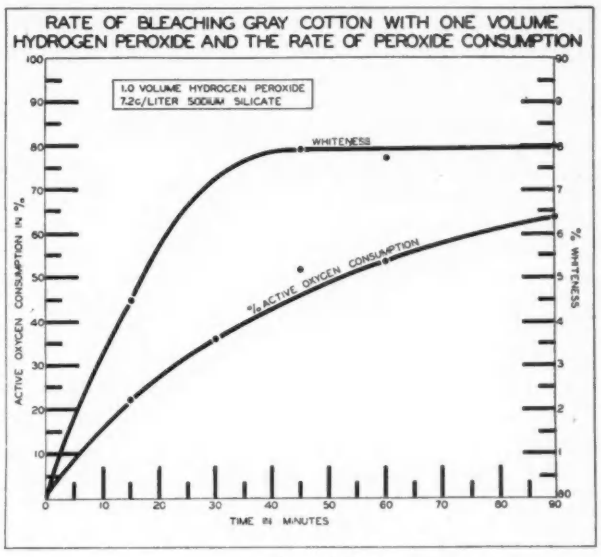
RATE OF BLEACHING GRAY COTTON WITH ONE VOLUME HYDROGEN PEROXIDE AND THE RATE OF PEROXIDE CONSUMPTION
1.0 VOLUME HYDROGEN PEROXIDE
7.2c/LITER SODIUM SILICATE
WHITENESS
% ACTIVE OXYGEN CONSUMPTION
ACTIVE OXYGEN CONSUMPTION IN %
% WHITENESS
TIME IN MINUTES

Fig. 4

partially bleach the motes so they will be eliminated in the final bleach step with a 0.5-1.0 volume peroxide bath. The behavior of a 1.0 volume peroxide bath on 80 x 80 cotton print cloth prepared by boiling for 15 minutes in water is shown in Fig. 4. The temperature during the storage period was 205°F. The bleaching proceeds rapidly during the early stages and gradually slows down toward the end of the treating period. In treating goods having patterns dyed with vat colors, it is desirable to use a bath of such composition that the peroxide will persist throughout the storage period. In these tests only 60 per cent of the active oxygen was used, allowing a considerable excess. This factor can be adjusted to meet any required conditions. This figure is illustrative only and for economic reasons it is desirable to have the residual amount of active oxygen as low as is compatible with good results.

In general the fastness of the vat dyes in the continuous process is the same as in peroxide kier bleaching, but somewhat higher temperatures can be used with safety. The saturating baths for both steps should be adjusted to pH 10.4-10.6 by the addition of sodium silicate and the storage temperature controlled at about 205°F. A few exceptions have been found where vat dyed patterns cause trouble under these conditions and require special handling in baths of lower pH or at lower temperatures. Since the goods are not subjected to the continuous circulation of the liquor as in kier bleaching, the clarity of the white areas is noticeably better. A number of the naphthol dyes have good fastness to these treatments but it is usually desirable to use a saturating bath controlled at pH 10.0-10.4 and to keep the storage temperature at about 190°-195°F. in both steps.

VARIATION OF THE BASIC PROCESSES

In order to meet some requirements, it is desirable to include one or more additional steps. These treatments are all well known and no new techniques are suggested. The list of treatments includes the following:

1. Singeing. This is the first treatment given to many fabrics.

2. Desizing. An enzyme treatment to solubilize the sizing in the untreated goods. In some cases only a water steep is used.

3. Washing. In many cases when the requirements are not too rigid, a suitable preparation can be obtained with a hot or cold wash given in the conventional manner.

4. Souring. A hot or cold acid treatment given before the goods enter the first step is an effective treatment. A similar souring operation may be included between the two steps of the process or after the second step where it is desirable to produce fabrics with a low ash content.

5. Mercerizing. This treatment may precede the first step in the continuous process (grey mercerizing), come between the two steps, or follow the final bleach (white mercerizing). Grey mercerizing fits into the continuous process well and meets many requirements.

In laying out a continuous bleaching system careful consideration must be paid to the selection of the treatments needed to supplement the basic process. The equipment should be arranged so that these treatments can be conveniently carried out and, if possible, obtain a flexible arrangement so that a variety of cloth routings can be used. Many routings are possible and the three following are offered as examples only.

A

1. Wash
2. Caustic or peroxide treatment
3. Wash
4. Peroxide treatment
5. Wash

B

1. Wash
2. Sour
3. Wash
4. Caustic or peroxide treatment
5. Wash
6. Peroxide treatment
7. Wash

C

1. Desize
2. Wash
3. Mercerize
4. Caustic treatment
5. Wash
6. Sour
7. Wash
8. Peroxide treatment
9. Wash

If the cloth is to be processed in rope form, the equipment may be arranged in a straight line or in a group. With the cloth in rope form it is quite feasible to turn one or more corners so that a great many different arrangements can be devised. If the cloth is handled in the open width it is perferable to arrange

the equipment in a straight line; corners can be turned if absolutely necessary, but are generally undesirable.

METHOD AND CONTROL OF SATURATION

The essentials of good saturation are as follows:

1. If the cloth is wet before it reaches the saturator, the moisture content must be reduced by squeezing so that it is lower than when it leaves. The squeezing should be done in a controlled manner and as much water removed as convenient.

2. The contact between cloth and liquor must be sufficiently intimate and the time of contact long enough to insure a uniform impregnation.

3. The concentration of chemicals in the saturating bath must be properly maintained.

4. The cloth leaving the saturator should contain approximately its own weight of solution.

In rope systems the saturators used for both steps may be of the single strand slack loop type (this is the conventional pit type). In this type an amount of slack can be accumulated in the saturator so that a soaking period is provided to permit the cloth to imbibe the treating liquor. In some special cases where it is desired to handle heavy goods in rope form a double dip rope saturator may be used to provide an extra long soaking period; improved saturation can be obtained by giving an intermediate squeeze between the two dips.

Open width saturators are used for both steps in the open width system. They are also used for the first step in rope systems where the nature of the fabric or the requirements demand it. If the goods are to be dyed, open width saturation has been employed in order to insure uniformity, since the goods are not very absorbent at this point. The apparatus should be so constructed that the cloth passes through the liquor, is squeezed, immersed and squeezed a second time. The intermediate squeeze is desirable for good saturation, since no slack is accumulated and contact time is usually short. A three bowl mangle or open soaper type of apparatus is usually used.

The differential between the incoming and outgoing squeezes is recommended because the well squeezed cloth more readily takes up the treating solution and also permits the feeding of a stock solution into the saturator. The bath strength must be constantly replenished by a controlled flow of a more concentrated stock solution. The concentration of the stock solution may be 3 or 4 times that of the saturating bath. There are many suitable methods for controlling the flow and a number of devices are made for such purposes. It is desirable that the rate of flow can be varied in order that fabrics of different constructions can be treated in the most suitable baths.

The saturating solutions should be analyzed at intervals as a check on the performance of the system. The active oxygen content of the peroxide bath can be determined with sufficient accuracy by the permanganate method[13], the alkalinity by titration with standard acid solution, and either potentiometric or colorimetric methods are suitable for pH determinations[14]. The caustic soda solution can be analyzed with standard acid, and fair control can be maintained by hydrometer readings; conductivity instruments can also be used in some cases.

The squeezing of the cloth can be done with the conventional type of squeeze rolls. The loading mechanism should be so arranged that the loading can be controlled and reproduced at will. Several mechanical methods are available for this purpose such as levers, screws, pneumatic or hydraulic pressure devices.

THE METHOD OF HEATING

After saturation, the cloth passes into a heating chamber. The chamber may take several different shapes to make it adaptable to different types of storage chambers. In the existing installations, it is in the form of a U tube which has an overall length of 30-40 feet. If the cloth is in rope form the vertical legs of the U are pipes generally 5-6 inches in diameter. If the cloth is in open width the vertical legs have a cross section in the form of a rectangle 6 inches on the short side and a little greater than the widest fabric to be treated on the long side.

A steam chest is located at the top of the second leg of the U, farthest from the entrance. The inner wall of this chest is perforated so that the steam is distributed on all sides of the cloth. A supply of properly conditioned steam is admitted through this chest. A large portion of this steam travels counter to the cloth toward the cloth entrance. The tube is made long enough to permit the uniform heating of cloth at high speeds; in this way each yard of cloth is properly heated and there is no chance for uneven heating.

The steam supplied to the cloth heater must be dry, saturated steam at atmospheric pressure. The conditioning of the steam supply is of prime importance. To meet these requirements the steam drawn from the mill supply must be expanded to atmospheric pressure by passing into an expansion chamber, which is simply a pipe of suitable length (usually about 15 feet) and larger than the steam supply line. Superheat can be removed by spraying water into the expanded steam. The use of superheated steam may create a drying atmosphere in the heater and storage chamber or the atmosphere may fluctuate between a drying and non-drying atmosphere. It is essential that the treatments be carried out in a non-drying atmosphere. After desuperheating, the steam may pass through a purifier to remove impurities and entrained water.

The temperature of the cloth is controlled by limiting the amount of steam entering the cloth heater and in some cases using a steam-air mixture. The flow of steam may be regulated automatically by a suitably located temperature control instrument. In comparison with kier processing the steam requirements are very low, since only 100 lbs. of water per 100 lbs. of goods are heated in each step, whereas about 400 lbs. of water are needed in kier work. Steam savings of 50 per cent and upwards have been realized with the du Pont process.

STORAGE CHAMBERS

The storage chambers used have been of the J piler type of more or less conventional shape, built in different sizes to accommodate different production rates. They have been built of 18-8 stainless steel sheets with the surfaces on which the cloth slides made from metal finished with a high polish. The pilers should be insulated to prevent heat loss; this may be done with glass wool, magnesia block or the equivalent. The cloth must be piled in the storage chambers in a regular manner so that it will pull out smoothly and evenly.

This part of the equipment functions as a conveyor to obtain the needed storage period of one hour for each step. There are other types of conveyors that can be used with equally good results, e.g., belt conveyors.

SUMMARY

The process consists of two basic steps supplemented by certain other auxiliary steps that may be incorporated in the process for certain fabrics or to meet certain production requirements. The method used for each of the two steps consists of saturating the cloth uniformly with its own weight of treating solution, heating to a predetermined reaction temperature in a chamber wherein all

surfaces of the cloth are exposed to an atmosphere of conditioned steam and storing or ageing the heated cloth without heat loss for a one hour reaction period.

The development has created wide interest and its use has been limited only by the difficulties attendant to the installation of new equipment under wartime conditions. However, there are now nine ranges in operation, eight for treatment of the cloth in rope form and one in open width. There are probably six million yards of cloth bleached by this process every week and the volume is gradually rising as the cloth speed is increased. Operating speeds have increased from 100 yards per minute to 170-190 yards in some of the later installations and there is no indication that the limit has been reached.

The steam consumption is less than with other bleaching processes and is closely approaching the theoretical amount required to heat the saturated cloth. The total cost of chemicals used in the process is lower than any other method of peroxide bleaching and is well in line with the lowest figures for hypochlorite bleaching. The overall cost picture is favorable. The quality of the processed fabrics has been good and the percentage of seconds has shown a profitable decrease as compared to older processes. While there are still some problems to be solved and improvements to be made, there is every reason to believe that the process will exert an important influence on cotton bleaching in the future.

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DISCUSSION

Chairman: We have a lot of bleachers here this evening; I know that we will have a very interesting question period following this paper. As a matter of fact, I recall an experience I had with peroxide a few years ago in connection with handling some goods which had been desized. I knew that when the goods hit the peroxide, my bleaching liquor completely exhausted and no bleaching took place; on giving the goods a second treatment considerable tendering had resulted. You mentioned handling goods, that had been malted or desized, through the continuous process—I was wondering if you had run into any difficulty with incomplete removal of converted starches.

A. No, we haven't. Both treatments are alkaline. If they weren't you might have trouble if there were starch present to form enough acidic products. You could tender cloth if the alkalinity was not sufficient to keep the goods alkaline all the way through the high temperature treatment.

Q. Do you use wetting agents?

A. We have used wetting agents and still use them in some of the installations. As far as the caustic treatment is concerned, I think caustic soda is about as good as anything you can use.

Q. Have you used silicate and caustic?

A. No, we haven't.

Q. There is some residual caustic in the first treatment carried over from washing, isn't there?

A. Well, that depends. You have to have sufficient washing so that you can control the amount of caustic going into the peroxide saturator. There is a limit to how much caustic you can carry in there. Sometimes in peroxide kier bleaching we bleach in baths of very high pH; but in the continuous system we find it desirable to keep the pH just about 10.6-11.0, this should go down to 10-10.4 for naphthols, and 10-10.6 for vat colors.

Q. What about the peroxide? Is the bath stronger or more detrimental to colors?

A. Fundamentally, what we are doing in the continuous process is eliminating water. The bath may be a little bit stronger but not very much so. Essentially, the hydrogen peroxide concentration is about ½ vol. where there are only a few motes, and from ¾—1 vol. in dirtier grades. It is the liquor ratio which has dropped from 1:8 down to 1.1, which is responsible for the savings.

Q. Hasn't this process evolved with the general improvement in the stability of the hydrogen peroxide as it is manufactured today?

A. Yes, it certainly has.

Q. How about tensile strength?

A. Tensile strength and fluidity in cuprammonium solution are excellent, the latter being about 4-5 rhes and falls in the range of well-bleached cotton.

Q. What is the comparative whiteness of the finished goods?

A. You can get any degree of whiteness you want. That is a function of the amount of peroxide used.

Q. How about mercerizing?

A. Mercerizing can be done at any point in the process where it is convenient, but most commonly in the grey stage before this process.

Q. Do fabrics like wool or acetate go through?

A. Well, of course the process is designed for high temperature operation which usually is not very good for wool. There are methods of bleaching wool by saturating with peroxide and storing where the cloth is heated by passing through a warm or hot solution.

Q. I should think you could bleach wool with an acidulated peroxide and get it down to a pH of 3.5 or 4.

A. So far there has been no practical application of anything like that.

Q. Is the conditioned steam of which you spoke removed at the discharge end of the roller?

A. The temperature is controlled by limiting the amount of steam which enters the heating chamber. You can do that automatically by placing a controlling thermometer bulb near the entrance of the heating tube. We have gradually increased the length of the heating tube to increase efficiency until we have approached the theoretical amount of steam required to heat the wet fabric. Very little steam escapes.

Q. You bring your fabric practically up to steam temperature?

A. Not always. For white goods the temperature in the peroxide treatment may be 205° to 210°F. Our plant work indicates that is the best temperature range to use. When we are bleaching dyed yarn fabrics and the yarn is vat dyed, the temperature is controlled about 205°F. If you have a pattern with naphthol colors in it, it is desirable to keep the temperature down around 190° to 195°F. We have done that by limiting the amount of steam or using a mixture of steam and air. On colors you also have to excercise good control over the pH of the saturating bath.

Q. What kind of heating unit do you have for open width goods?

A. The open width heater is only 6″ deep and a little wider than the widest fabric handled. The over-all length and other details are similar to the heater used for rope work.

Q. Do the J boxes maintain their heat?

A. Quite well, as they are insulated with 2" magnesia block or 1-½" of glass fiber insulation.

Q. What kind of metal do you use?

A. The storage chambers are built of stainless steel, about 16-gauge metal, and the heating tubes are a little bit heavier. The sliding surfaces are given a mirror finish.

Q. Why is stainless steel necessary?

A. The storage chambers run without any conveyor and you have to select a metal with a low coefficient of friction so that the cloth will slide. There are other metals which might be used but stainless is the best. Actually none of this equipment has been built of anything but stainless.

Q. May I ask about scale formation?

A. That is pretty much a matter of housekeeping. There have been one or two instances where scale has formed, particularly if the units weren't cleaned out after using.

Q. Do you have any trouble with friction marks?

A. That may be traceable either to the scale formation of which we spoke but most probably to the mechanics of handling the cloth as it passes through the range.

Q. In that J-piler have you some kind of conveyance so that there will be no drag on the fabric when it comes out?

A. No, it does quite well. Actually the cloth is being pulled from the low joint in the J.

Q. What do you use for squeeze rolls?

A. Rubber. And it is desirable to load these squeeze rolls in such a manner that the squeeze can be reproduced. A rubber-stainless steel combination could also be used.

Q. What is the minimum floor space and head room necessary?

A. The storage chambers are about twenty-two feet high overall. The minimum head room would be about twenty-five feet. The floor space depends on how the equipment is arranged. The straight line arrangements are about 100 to 125 feet long and 25 feet wide. A 65-foot square can be used for a compact group arrangement.

Q. What is the relative speed of the rope bleach and open width?

A. The speed of the rope systems originally was 100 yards a minute and it is now up to 190 yards a minute. The open width speed has gone as high as 100 yards a minute, depending on the weight of the fabrics. We have not yet reached the limit.

Q. What are the heaviest goods you have handled?

A. About one yard or one and one-half yards per pound in open width equipment.

Q. What are the lightest goods you recommend for this process?

A. The lightest goods which have been handled are in the neighborhood of 5½ to 6 yards per pound. I don't know that there is any limit. I think we will be able to handle goods of practically any weight provided the mechanics of the system are such that you don't distort them.

Q. What is the overall time required?

A. About two hours and twenty minutes for complete processing.

Q. Does that time apply to all fabrics?

A. The length of time would be just about the same.

Q. In a unit such as you describe, how many men are required?

A. The ranges now in operation run all the way from one and one-half men to about three and they turn out up to a couple of hundred tons of cloth a week.

Q. How much do these units cost?

A. About $6000 to $8000 for the heaters and storage chambers; the washing equipment, etc., is standard.

Q. When you change from one kind of bleaching to another, do you shut down the plant?

A. No, we haven't had to shut down any plants to change bleaching processes.

Q. Do you think the conventional kier will become obsolete in time?

A. Of course I think it will, except for specialties.

MEETING, NEW YORK SECTION

THE Annual Business Meeting of the New York Section was held on June 9th at the Downtown Athletic Club, 19 West Street, New York City, Patrick J. Kennedy, chairman, presiding.

A letter from the chairman of the Philadelphia Section, Boyce C. Bond, was read. This referred to the Annual Meeting to be held in Atlantic City on October 12th, 13th and 14th, under the auspices of the Philadelphia Section.

The treasurer, Edward H. Schmidt, reported a cash balance of $1,207.78. He pointed out that it had not been necessary to call on the national body for funds.

It was voted that the New York Section apply for corporate membership in the national association. The sum of $500 was appropriated for this, to be prorated $100 annually.

The secretary, Norman A. Johnson, reported that minutes of all meetings had been published in the Proceedings.

Kenneth H. Barnard submitted for the councilors a report prepared by J. Robert Bonnar. This report pointed out that, during the last three or four years, attendance at the council meetings had been practically 100% on the part of the New York Section representatives. It also reviewed the activities of the Council during the past two years.

Mr. Barnard also referred to the Intersectional Contest to be held at the Annual Meeting. He stated that all eight sections will be represented this year.

P. J. Wood reported for the New York Section committee for the Intersectional Contest and stated that progress was being made.

The chairman of the technical program committee, Dr. Herman E. Hager, reported on the programs that his committee had arranged for the past season.

The chairman of the membership committee, Thomas F. O'Brien, reported that the New York Section had gained a total of 166 new members during the past two years.

The chairman of the registration committee, Paul J. Luck, reported that by means of registration it had been possible to determine the number of non-members attending meetings. This information was turned over to the membership committee with results as noted above.

The chairman of the corporate membership committee, Leonard S. Little, reported that his committee had had a number of meetings and was now actively engaged in raising the New York Section quota. He expressed the belief that the Section would raise more than its quota of $12,000.

It was announced that a report on promotion and publicity of the New York Section, prepared by Winn Chase, had been turned over to President William D. Appel for study.

The chairman of the nominating committee, P. J. Wood, presented the committee's slate of officers for the 1944-45 season. These officers, whose names appeared in the June 19th issue, were unanimously elected.

At this point the meeting was turned over to the chairman-elect, Emmett Driscoll, who presented Henry E. Hird, vice-president and secretary of Samuel Hird & Sons, Inc., Garfield, New Jersey. Mr. Hird spoke briefly on "The Value of a Hobby" and then presented three colored motion pictures entitled: "Desert Life," "Packhorse Trip in the Canadian Rockies" and "Fishing and Hunting." These remarkable pictures were thoroughly enjoyed by the audience.

The attendance was approximately 120.

Respectfully submitted,

NORMAN A. JOHNSON,

Secretary

The Dyeing of VISCOSE RAYON YARN in Cake Form

C. M. WHITTAKER

THE annular package produced in the centrifugal spinning box invented by C. F. Topham in 1900 for the spinning of viscose rayon yarn is known throughout the rayon trade as a "cake."

In the past, viscose rayon producers wound the wet cakes into skeins prior to desulfurizing and bleaching. More recently, however, these wet processes have been carried out with the yarn in cake form, with a consequent reduction in labor costs and a marked improvement in the quality of the yarn. This practice has resulted in the almost complete cessation of deliveries by Courtaulds Ltd. of viscose rayon yarn in skein form.

As the result of dyeing viscose rayon in cake form, many technical advantages are gained in subsequent processing, viz.— (1) One operative can supervise the winding of more dyed cakes than dyed skeins, whilst less time is taken to train a cake winder than to train a skein winder. (2) There is less winding waste. (3) Cake-dyed yarn is superior in quality to skein-dyed yarn. (4) There are fewer knots on the cones. (5) The rate of production in weaving and knitting is higher.

This development in viscose rayon manufacture has presented the skein dyers with the problem of undertaking the dyeing of viscose rayon yarn in package form, and it is with the object of giving some guidance in this matter that the Directors of Courtaulds Ltd., have consented to the publication of the present paper, which is based on the practical experience of dyeing 1,500,000 lbs. of viscose rayon cakes.

The development of dyeing in cake form was a logical, inevitable, and progressive step in the processing of viscose rayon, and it may possibly be wondered why it did not occur earlier, but it must be appreciated that cake dyeing is a comparatively new method.

At Droylsden, the first batch of cakes, weighing 168 lb., was dyed on the commercial scale on 8th January, 1937, at the time of the demand for end-and-end gold and white warps, which formed a very convenient outlet for the initial bulk dyeings, since any unevenness could not be seen in such warps. The present author's colleagues at Coventry had been at work on the problems associated with the wet processing of cakes for some years previously, and it was only their success which made the subsequent dyeing of cakes feasible.

DYEING MACHINE

The first problem in connection with the dyeing of viscose rayon cakes is the machine. In the early experiments at Droylsden all sorts of methods were tried which, in retrospect appear to be more amusing than serious. Thus, the dyeliquor was sprayed continuously into individual rotating spin boxes; or the spin box was inverted and rotated in the dyeliquor itself; or cakes were dyed on vertical and horizontal perforated tubes, with and without formers; or cakes were dyed in foam baths; or cakes were dyed packed like bricks in an Obermaier machine, and repacked and repacked until penetrated.

Finally, the machine used at present was evolved and, although it is not considered to be the last word in machines, it serves its purpose. This machine was designed by combining different ideas from many types of machines, and it was built for Courtaulds Ltd. by the Longclose Engineering Co. Ltd., by whom it is marketed.

The machine is of stainless steel, with a water-sealed centrifugal pump, valves and pipes for two-way circulation, and with an expansion tank in the circuit. The double-bottom container holds from 5 to 42 perforated spindles placed vertically. Each spindle has a screw thread at each end and is screwed into the container, and, therefore, may be removed or reversed as required. The containers may be lifted bodily out of the machine by means of an electric crane for loading and unloading, whilst duplicate containers for each machine enable one container to be unloaded and reloaded while another batch is being dyed.

The spindles on the large machine take 9 cakes, those on the medium sized machine take 7 cakes, and those on the smallest machine (25 cakes capacity) take 5 cakes, from which it is evident that the capacity of the largest machine (42 spindles) is 378 1-lb. cakes.

These machines were deliberately designed to be very elastic in respect of the weights of material they would take. In order to achieve this purpose, each spindle is blanked off at one end so that, if the spindle has no cakes on it, circulation of the liquor through that particular spindle may be prevented by simply reversing it and screwing the blank end into the base of the container. Further, if the weight of material ordered only fills part of one spindle, the spindle may be completely filled by adding the necessary number of non-perforated cake holders, thus giving perfect adaptability for broken weights of material.

Experience at Droylsden has shown that the results are better with large batches than with small batches. This is attributed to the fact that the influence of leakage caused by ill-fitting, collapsed, or distorted cakes is not so great in a large batch as in a small one. Based on this experience, cake dyeing is not undertaken for lots smaller than 25 cakes to a shade.

A laboratory-scale machine which will take 1 or 2 cakes is also available. This machine is useful for small-scale tests, but it has very definite limitations. One of its merits is that the results are always poorer than similar dyeings in the large machines, so that, if a fair result is obtained on the laboratory machine, a good result will be obtained in bulk with the same dyes.

The cake holders used are made of Bakelite and are perforated; the preferred type is called a "window" holder, and has 5 large holes in the center of the barrel of the holder. Another type is drilled with a large number of small holes which should not be carried right to the top or bottom of the holder. If the cake fits well on the holder, the style of perforation does not matter, and the cake will dye satisfactorily with only one large hole in the barrel of the holder. Each cake is mounted on a separate holder, and the holders are stacked one upon another. The top one is fitted with a lid which permits the column of holders to be screwed tight to the spindle by means of a suitable nut. The cakes must be well fitted on the holders, and girls are most suitable for this work; if the cakes are badly fitted, a bad result is highly probable. Now that the cakes supplied by Courtaulds Ltd. are (and will be) of standard size, it is possible to obtain good

* Presented at meeting, Manchester Section, Society of Dyers and Colourists, October 15, 1943. Published in their Journal, May, 1944.

fitting, but if the dyeing is prolonged, e.g. to 6 hr., a few collapsed cakes may be anticipated, although it does not always follow that a collapsed cake will be poorly penetrated. Penetration will depend on the stage of the dyeing at which the cake collapsed; if it collapsed at an early stage, it is unlikely to be properly penetrated.

Two-way circulation is advised, although circulation from inside to outside is considered the more efficient. Moreover, theoretically, two-way circulation reduces the thickness of the package to one-half. The pressure when circulating the liquor from inside to outside runs consistently with a difference of 4 lb. between the forward and back pressures, but circulation from outside to inside is never so consistent, due to variable leakage. Circulation is always started from inside to outside, and the final circulation before lifting out of the dyeliquor is from inside to outside, because this frees the cakes from the holders and so facilitates their removal. The periods of circulation are 20 min. from inside to outside, and 10 min. from outside to inside, throughout the dyeing.

With easy levelling dyes, e.g. Chlorazol Fast Orange G (I.C.I.), many shades may be dyed with inside to outside circulation only. In bulk dyeing, however, dyed lots frequently show cakes which are definitely lighter in shade on the outside to a depth of a few threads, but circulation from outside to inside for 10 min. corrects this defect.

The dyer of cakes, unlike the skein dyer, cannot see the material being dyed, and so cannot estimate the degree of penetration and evenness of the resulting dyeing; he is therefore always in a state of considerable anxiety as to the success of his dyeings. Thorough examination of cakes for evenness of shade and penetration depreciates their subsequent windability, and this fact limits the number of cakes which may be examined before a batch is despatched. It requires great skill and judgment to examine a cake with the minimum of disturbance and to say whether it is evenly dyed, as well as completely penetrated. At Droylsden this work is done by girls whose touch is much more delicate than that of a man; they are, therefore, much more skilful in re-forming the cake after examination. The examination is made in the wet state, after the cake has been hydroextracted subsequent to final matching, and before the lot is unloaded from the machine.

It is our experience at Droylsden that, if channelling occurs in a cake, thereby producing white places due to lack of penertation, circulation of the dye liquor may be continued indefinitely without covering the white places. There are two ways of correcting this fault. (1) The cakes are taken off the holders, hydroextracted and then put back again on the holders, when they will usually be corrected perfectly after a further very short time in the dye liquor. The correction is due to the fact that handling and hydroextracting alters the lay of the traverse and thereby re-forms the cakes, so that the channelling due to the initial deformation is removed. (2) In extreme cases it is advisable to dry the cakes as well. A faulty lot of cakes which has been dried has always responded to correction, but increasing experience has shown that faulty penetration can usually be corrected merely by hydroextracting. When dry, a little yarn is wound on separate bobbins from the outside, middle and inside of one cake. These bobbins are knitted on a single-thread knitting machine in successive panels of outside, middle and inside, and the resulting knitting gives a very good guide as to the evenness and penetration of the shade, although, of course, the test is actually representative of only one cake. Incidentally, examination in white fluorescent lighting is better than examination in average daylight for revealing faulty dyeing.

The problem of package dyeing has two aspects, viz. mechanical and technical. The mechanical aspect has been dealt with first, because correct dyeing presupposes circulation of the dye liquor through the packages in as nearly uniform a manner as is possible from an engineering point of view.

TECHNICAL ASPECTS

The present standard weight of the cakes supplied by Courtaulds Ltd. is 16 oz. which, under the exigencies of wartime labor shortage, sometimes rises to as much as 20 oz. It is definitely intended, however, that the cakes shall be considerably increased in weight when the requisite alterations to the spinning machines can be made.

A viscose rayon cake is a most efficient filter. It will be immediately realized, therefore, that a water supply of good quality, free from sediment, is absolutely essential, and it will also be appreciated that the finer the filament denier, the greater the need for pure water. Manchester Corporation water is used at Droylsden, but it is found necessary to use in addition a dispersing agent, e.g. Calgon, since experience has shown that the cakes are liable to be dirty if Calgon is not added. The use of 4 oz. of Calgon per 100 gal. of liquor circulated through the cakes has been made standard practice.

The time of dyeing varies from 2½ hrs. to 6 hrs., according to the nature of the dyes, the depth of shade, and the filament denier of the yarn. Consequently, it must not be forgotten that Calgon is liable to develop acidity on prolonged boiling.

It still remains true that the major portion of viscose rayon is dyed with direct cotton dyes. Further, the prohibition of the production of furnishing fabrics during the war has substantially reduced the demand for vat dyed shades on rayon, so that our experience of cake dyeing has been largely confined to dyeings with direct cotton dyes.

The liquor-goods ratio in the machines when fully loaded averages about 18:1, but this is not the most material point. The point to be remembered is that the effective liquor-goods ratio at the face of the stationary threads in the cake, which is where the dyeing takes place, is not more than 3:1.

Passing to the dyeing aspect, it must be realized that the use of concentrated dyes in order to control their salt sensitivity is not sufficient unless the water being used is reasonably free from electrolytes. A water of initial hardness of, for example, 26°, even if Permutit-treated, is not to be recommended for cake dyeing, because it entails working continuously under a most severe handicap, the removal of which could only be effected by means of a retarding agent for direct cotton dyes effective in water heavily charged with electrolytes. No such retarding agent is known to the present author. On the other hand, it is not necessary to use an electrolyte-free water, such as that obtainable by the new double resin treatment of the Permutit Co. Ltd. Manchester Corporation water is used at Droylsden, and both Glasgow and Bradford waters are equally suitable. It is the type of water which is frequently met with in the Midlands and South-East England that is not very suitable for cake dyeing.

The present author and his colleagues have written so much about the individualism of dyes, salt sensitivity, and the use of that best of all dyeing assistants, commonsense, that it is now hardly necessary to discuss these topics further. In addition, it is pleasing to note that the dye manufacturers are now responding to the frequent appeals that they should publish the requisite information about their own dyes. In the case of at least one firm the eyes of the staff concerned have been opened to properties of their own dyes about which they were ignorant, and the new data have proved of definite commercial advantage in showing them that some of the mixings illustrated on their pattern cards were ludicrous! It was also seen that some of their dyes were, like some of our journeys, "not really necessary."

Unless the properties of the dyes being used are known to the cake dyer in respect of migration, rate of exhaustion and salt sensitivity, he is working blindly and deserves all the trouble which he will inevitably meet.

(To be concluded)

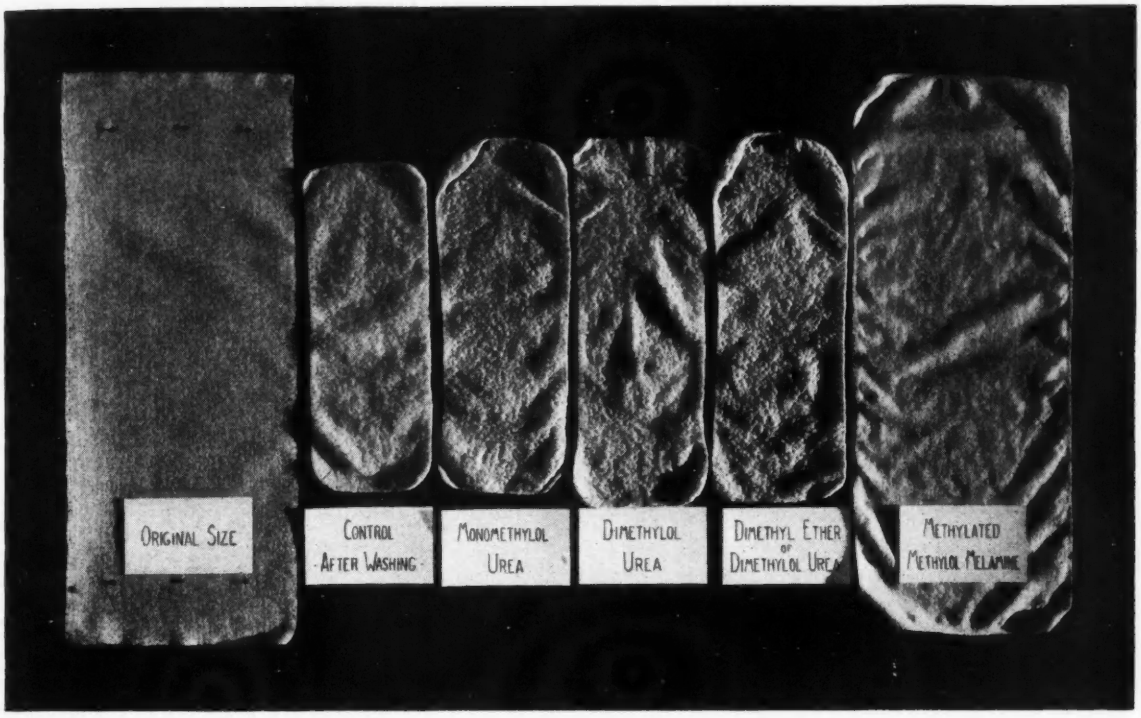


Figure I.
(Swatches after 10 launderings according to CCC-T-191a)

Reducing WOOL SHRINKAGE AND FELTING with Melamine Resins*

EDWIN P. JOHNSTONE

WOOL and wool containing fabrics have a very undesirable tendency to shrink and felt when subjected to ordinary washing operations, and the development of a satisfactory method for treating wool to prevent this shrinkage has long been a problem in the textile industry.

A number of methods have been proposed, most of which are dependent upon a chemical treatment of the fiber. A large amount of research has been directed toward the development of processes employing chlorine or chlorine-containing chemicals, such as sulfuryl or chromyl chloride (1), chlor sulfonic acid (2), a,á-dichloro dimethyl ether (3), p-toluene sulfondichloramid (4), and in one instance, another member of the halogen family, bromine (5) has been utilized for this purpose. These chemicals are applied in aqueous solutions or dispersions, or dissolved in organic solvents. Chlorine in gaseous form has been used in one process (6). This research would appear to have evolved from the sodium hypochlorite processes long in use in the textile industry. In recent years, other approaches to this problem have been made, and it has been discovered that enzymes such as papain or trypsin (7) may be used to reduce shrinkage and felting of wool. Considerable interest has been shown in the treatment of wool with caustic alkalies (8), and in other instances inorganic reducing agents, such as sodium sulfite or bisulfite followed by treatment with metallic salts (9), and sodium sulfides, polysulfides, or hydrosulfides (10) have been used. Likewise, organic reducing agents, i.e., aliphatic, aralkyl, or polymeric mercaptans, thioglycols, and polythiols (11) have been found to reduce shrinkage of wool fiber.

Numerous difficulties have arisen in the commercial utilization of these methods based upon a chemical treatment of the fiber. In general, this type of treatment requires careful chemical control of the process to prevent excess damage of the fiber. In certain of the above processes, the moisture content of the wool must be controlled within rather narrow limits to obtain satisfactory results. In other instances, special equipment, not common to the textile industry, is necessary. The use of certain organic solvents presents a definite fire hazard, and some of the chemicals employed may have a detrimental effect upon the worker due to their toxic properties.

Speakman (12) states that "it should be possible to reduce the felting power of wool by modifying its elastic properties. Examples of the manner in which modified elastic properties may reduce the felting power of wool have been found in the case of heavily dyed fibers and fibers treated with tannic acid-tartar emetic resist. In both cases, reduced felting is due to an increased resistance to deformation, and a reduced power of recovery, brought about by the impedance offered by the dye molecules or the resist to the unfolding and folding of the main peptide chains."

* Contribution from the Research Laboratory of the American Cyanamid Co., Stamford, Conn.

Recently, investigations have been carried out in an endeavor to perfect methods of reducing shrinkage and felting of wool using materials which in themselves do not chemically attack the wool fiber. Water-insoluble cellulose ethers or esters of lower aliphatic carboxylic acids, i.e., ethyl cellulose or cellulose acetate (13, 14) have been the subject of recent patents. Likewise, it was believed that a resinous material might be of value and a method of polymerizing a urea-formaldehyde resin on the fiber was developed (15). Investigations were also made of the effect of polymerizing formaldehyde itself on wool fiber (16).

Work in this laboratory, as disclosed in U. S. Patent No. 2,329,622, has shown that alkylated methylol melamine resins may be used to reduce the shrinkage and felting of wool fiber. These resins are prepared in the following manner:

1. Lime is produced from limestone:

$$CaCO_3 \xrightarrow{2000^\circ\ F.} CaO + Co_2$$

2. Calcium carbide is formed from coke and lime:

$$CaO + 3C \xrightarrow{3500^\circ\ F.} CaC_2 + CO$$

3. Calcium cyanamide is formed by nitriding:

$$CaC_2 + N_2 \xrightarrow{2200^\circ\ F.} CaNCN + C$$

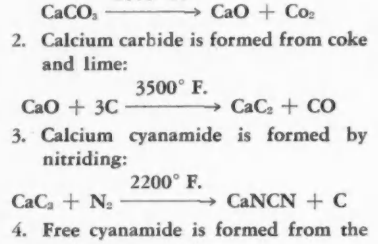
4. Free cyanamide is formed from the calcium cyanamide:

$$CaNCN + H_2O + CO_2 \longrightarrow H_2NCN + CaCO_3$$

5. Dicyandiamide is obtained from cyanamide by polymerization:

$$2\ H_2NCN \longrightarrow H_2NC(=NH)-NH-CN$$

6. At proper temperatures and pressure, melamine is formed from the dicyandiamide:



7. Resin intermediates, such as the methylol melamines, are formed by the reaction of melamine with formaldehyde in suitable combining ratios. The mechanism of the combination is illustrated diagrammatically as follows:

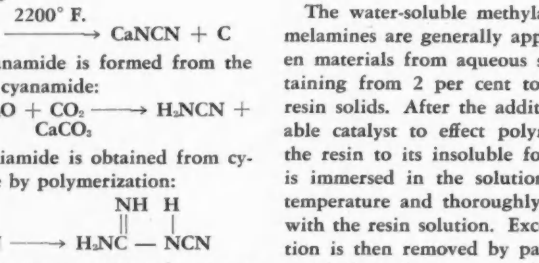
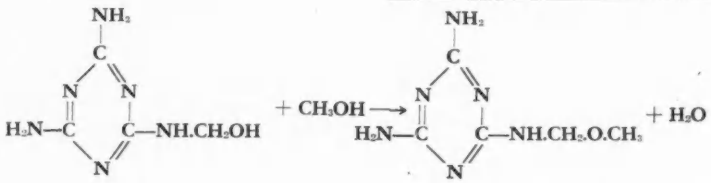


TABLE I.

Per cent Methylated methylol melamine	*Per cent Shrinkage after Washing*		
	15 Min.	*30 Min.*	*60 Min.*
Untreated	11.1	18.0	29.2
2.5% Methylated resin	4.2	5.5	12.5
5.0% Methylated resin	2.1	3.5	5.5
10.0% Methylated resin	1.4	2.1	2.4

8. In the final step, the methylol melamines are alkylated by reaction with alcohols, such as methanol. The mechanism of the reaction is believed to be as follows:



Methylated methylol melamines can be prepared which are soluble in cold water. It is also possible to prepare ethylated methylol melamines that can be dissolved in alcohol-water mixtures. For general convenience, the water soluble methylated methylol melamines are used commercially.

The water-soluble methylated methylol melamines are generally applied to woolen materials from aqueous solutions containing from 2 per cent to 15 per cent resin solids. After the addition of a suitable catalyst to effect polymerization of the resin to its insoluble form, the wool is immersed in the solution at ordinary temperature and thoroughly impregnated with the resin solution. Excess resin solution is then removed by passing the material through squeeze rolls, or by centrifuging to leave the desired amount of resin in the fiber. The resin is not substantive and does not exhaust from the bath. The material is subsequently dried in the ordinary manner, and the resin is then polymerized by subjecting it to temperatures of 230°-300° F. for 4 to 45 minutes, the time required being approximately inversely proportional to the temperature.

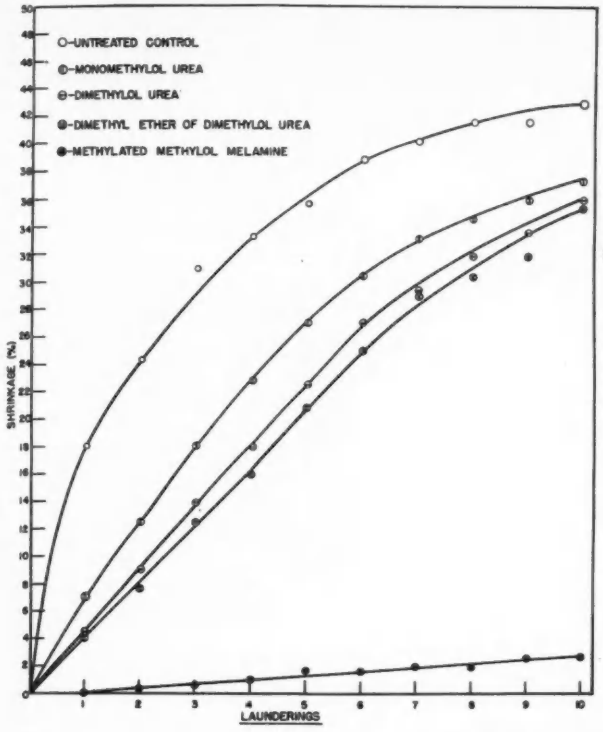
The degree to which shrinkage of an all-wool lightweight flannel was reduced by treatment with methylated methylol melamine is shown in Table I.

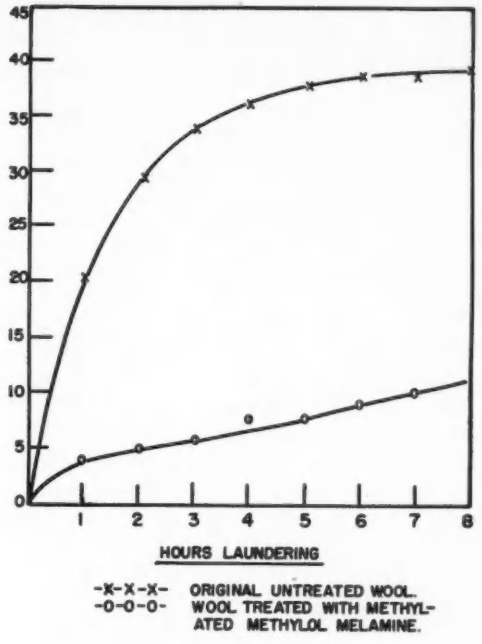
Although urea formaldehyde resins produce a partial reduction in shrinkage and felting of wool fiber, the degree of shrinkage control is not maintained throughout a number of repeated launderings. The methylated methylol melamines produce a reduction in relaxation shrinkage and an almost complete elimination of shrinkage due to the felting phenomenon and this shrinkage control is maintained throughout a large number of launderings. This is shown in Graphs I and II. The launderings were carried out in a reciprocating type washer using 0.25 per cent neutral soap solution (50 : 1 ratio) at 100° F. for 10 minutes followed by two rinses in water at 100° F. for 5 minutes and 1 minute respectively, in accordance with Federal Specifications CCC-T-191a, the wool material being dried before the measurement of shrinkage was made.

The appearance of the laundered swatches of wool fabric in comparison with an original unwashed swatch are illustrated in Fig. I.

Recent investigations of the dyeing of wool fibers after treatment with methylated methylol melamine by the Microscopical Laboratory of the Calco Chemical Division (17) show that the polymerized resin is distributed uniformly throughout the individual fibers. This suggests that the resin is between, if not within, the cortex cells of the fiber. The reduction in shrinkage and felting would thus appear to be due to a modification of the entire fiber, and in this respect, the process differs from previous processes which are characterized by a modification of the epithelial scale surface of the fiber.

The application of methylated methylol melamine to wool materials to reduce shrinkage and prevent these materials from felting during subsequent laundering, has been found of considerable interest on both woven and knit fabrics, as well as hosiery. The equipment employed in carrying out the process is common to the textile industry, although the "curing" operation to set the resin, requiring the use of somewhat higher temperatures





Left—Graph I; Above—Graph II

than are now customarily employed in the woolen industry, may necessitate utilization of drying equipment common throughout the cotton and rayon industry for the curing of resin finishes. Present investigations include attempts to adapt the process to wool fiber in the form of yarns and to scoured wool raw stock.

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TRADE NOTES • NEW PRODUCTS

• NEW CARBIDE & CARBON PRODUCTS

Carbide and Carbon Chemicals Corp., 30 East 42nd Street, New York 17, N. Y., has issued technical information sheets on five new products as follows:

Mercaptoethanol—a liquid with the properties of both an alcohol and a mercaptan. It is completely miscible with water, benzene, ether and most organic solvents. It is believed that the product will be useful in the preparation of pharmaceuticals, dyestuffs, rubber chemicals, flotation agents, pickling inhibitors, insecticides, synthetic resins and plasticizers for synthetic resins. Its solvent powers make it of interest for sulfur dyestuffs and certain of its derivatives are intermediates for wetting agents. Technical Information Sheet, Form 5428.

Thialdine (5,6-dihydro-2,4,6-trimethyl-1,3,5-dithiazine)—a colorless, crystalline solid which is soluble in ether, alcohol and hydrocarbons but relatively insoluble in water. This amine has possible application as an intermediate for dyestuffs, insecticides, rubber chemicals, pharmaceuticals and ore-flotation operations. Technical Information Sheet, Form 5689.

Ethylhexanediol—a high boiling, colorless glycol, with limited water solubility. It is stated that the product is a possible raw material where improved water resistance and higher solubility in hydrocarbons are desirable. It is also of possible use as an intermediate for perfume fixatives and synthetic resins. Present heavy demands, of the armed forces, for the product for use in insect repellents will probably limit its availability during the war period. Technical Information Sheet, Form 5691.

Methyldiethanolamine—a new amine with characteristic odor which is completely miscible in water and benzene. This product is said to show promise in the manufacture of dyestuffs, textile chemicals, insecticides and emulsifying agents. Technical Information Sheet, Form 5733.

Tergitol Penetrant 4 Paste—a slurry of Tergitol Penetrant 4, made up of 50 per cent dehydrated sodium tetradecyl sulfate and 50 per cent water. It is said to be exceptionally pure, containing practically no inorganic salts or mutual solvents. It is further said to enhance the activity of bactericides and increase the efficiency of antiseptics from four- to ten-fold. It also has possibilities as a detergent of the

"soapless soap" type. Technical Information Sheet, Form 5688.

Copies of the information sheets are available upon request to Carbide and Carbon.

● **JOINS VERNEY MILLS**

William F. Brosnan has been appointed manager of finishing operations for Verney Mills. Mr. Brosnan will be in charge of the finishing plant at the Verney Taunton Mills, Inc., Taunton, Mass., and the finishing plant of Verney Mills of Canada, Ltd., at Granby, Quebec. He will supervise the finishing of all fabrics from the six Verney mills.

Mr. Brosnan was previously with F. P. Maupai Dyeing Co., Farr Alpaca Co. and Bradford Dyeing Association.

He is a member of the American Association of Textile Chemists and Colorists.

● **NEW BOOKLET**

The New Jersey Zinc Company, 160 Front St., New York, N. Y., has just published a new booklet entitled, "The ABC of Luminescence" which discusses in simple language the characteristics, properties, limitations and applications of the inorganic luminescent pigments, as well as the terms applicable to this industry. A number of simple tables and charts are included to illustrate such terms as "the dark-adapted eye" and "the decay of afterglow."

● **CELANESE PATENT**

Celanese Corporation of America was recently granted United States Letters Patent Number 2,351,174 which relates to coated fabrics such as artificial leather.

The novel coated material of this patent comprises a fabric base containing doubled yarns of filamentary cellulose derivative material, such as cellulose acetate, and filamentary material of non-plastic nature. Bonded to this fabric is a coating composition comprising a cellulose derivative, such as cellulose acetate.

The resultant coated fabric is characterized by having an improved bond between the fabric base and the coating, and is eminently suitable for use as artificial leather, it is stated.

● **QUAKER ADDS FIELD ENGINEER**

Quaker Chemical Products Corp., manufacturers of chemical specialties for the textile industry, announce the addition of Eugene B. Martin to their staff of process engineers. Mr. Martin, who will service hosiery mills in Eastern Pennsylvania, has a broad background of experience in the textile field, having served as boss dyer in the Colonial Knitting Mills, Inc., at Philadelphia, for 13 years and as a consultant in the dyehouse of the Russell Manufacturing Co., Inc., Middletown, Conn., for four years. In addition, Mr. Martin was a member of the dyestuffs department of E. I. duPont de Nemours during the first seven years of that department's existence and was more recently employed by the Resinous Products Co., Philadelphia, Pa.

● **ARMY-NAVY "E" AWARD**

The Saltville plant of The Mathieson Alkali Works was awarded the Army-Navy "E," at a ceremony held June 19, for high achievement in the production of war materials.

The "E" flag was presented by Col. Frederick C. Horner, chief, Highways Division, Transportation Corps., Washington, D. C., and accepted by George W. Dolan, president of the Mathieson organization.

● **NEW BOOKLET ON CLORAFINS**

A new technical booklet describing the unusual properties of Clorafin 42, plasticizer, and Clorafin 70, resin, used in the production of fireproof, waterproof, and weatherproof coatings for fabrics, has been issued by Hercules Powder Company's Cellulose Products Department.

Clorafin 42, a light-amber, viscous, nonflammable plasticizer, is said to emulsify very easily. Recent tests show Clorafin 42 to be a good plasticizer for some of the vinyl resins, it is stated.

Clorafin 70 is a pale straw-colored, hard, brittle resin, with even greater flame-extinguishing characteristics. Present uses in addition to the formulation of flameproof coatings and waterproof coatings, include the formulation of flameproof paints and flameproof adhesives.

It is believed that Clorafin 70 will be useful in many applications where flameproofing qualities, hardness, and stability are important because of its very good stability and compatability with plasticizers and other resins.

At the present time both Clorafin 42 and 70 are available to companies with a priority rating.

● **GEIGY COLOR CARD**

Color card No. 318-D, published by Geigy Company, Inc., 89-91 Barclay St., New York, N. Y., describes and displays their line of Solophenyl dyestuffs. This group of direct colors, it is stated, has exceptional resistance to sun light, making them valuable for the dyeing of such materials as upholstery cloths, curtains, draperies and outer wear. The Solophenyl series is said to be applicable to all types of cotton, viscose and Bemberg rayons and, in addition to light fastness, these colors are said to possess superior resistance to washing and perspiration (when dyed in light and medium depths) than the average direct color—especially on rayons. The color card contains a complete fastness rating chart and instructions for dyeing this line of Solophenyl colors.

● **ELECTED PRESIDENT, ELECTRO METALLURGICAL COMPANY**

Francis P. Gormley has been elected President of Electro Metallurgical Company, Electro Metallurgical Company of

Francis P. Gormley

Canada, Ltd., Haynes Stellite Company, Michigan Northern Power Company, and Union Carbide Company of Canada, Ltd., units of Union Carbide and Carbon Corporation. Mr. Gormley was graduated from the University of Michigan with a degree in Electrical Engineering in 1909. He immediately joined Union Carbide Company at Sault Ste. Marie, Michigan, as an electrician, and he has served continuously in various production and executive capacities since that time.

● **TEXTILE SCHOOLS COOPERATING WITH VETERANS ADMINISTRATION**

E. W. Camp, Dean of the Department of Textile Engineering of the Alabama Polytechnic Institute, Auburn, Alabama, who was elected President of the National Council of Textile School Deans at their recent Spring meeting in Asheville, North Carolina, has just announced the appointment of a committee to cooperate with those officials of the Veterans Administration charged with direction of the educational features of the rehabilitation program. The committee consists of Charles H. Eames, Chairman, President of Lowell Textile Institute; W. D. Fales, Head, Textile School, Rhode Island School of Design; Malcolm E. Campbell, Dean, North Carolina State College Textile School; and Richard S. Cox, Dean, Philadelphia Textile Institute.

As a result of a conference with government officials just concluded in Washington an introductory statement was prepared and is now being distributed to the fifty regional offices of the Veterans Administration so that advisors in those offices

may have available more precise information about opportunities for employment in the textile industries and about training facilities available in the textile schools.

• OLD PRODUCT GETS NEW NAME

Krieger Color and Chemical Company, 6531 Santa Monica Blvd., Hollywood 38, Calif., announce they have officially changed the name of their plastic dye product, "Lucidip," henceforth to be called "Kriegr-O-Dip." Products of this plant have always been identified through the trade mark name containing a part of the owner's name Krieger.

"Kriegr-O-Dip" is being used for dyeing Acrylic Plastic by the dipping method by many manufacturers throughout the country who are producing special war equipment using plastics that must be colored permanently and effectively. It is also being used by the Aircraft Industry in dyeing plastics used in highly specialized equipment, it is stated.

• NEW PLASTIC

A new thermoplastic, said to hold its shape and strength in boiling water and which can be molded by the fastest, most economical methods, was announced today by Charles Belknap, president of Monsanto Chemical Company. Known as "Cerex," the new plastic opens up an entirely new field of industrial and household applications by virtue of its ability to withstand sterilization.

"Cerex" is one of the results of a long-range research program started six years ago in Monsanto laboratories at Dayton, Ohio, and Springfield, Mass., to develop plastics and other synthetic chemicals from petroleum sources. As a wholly new material it holds a post-war promise of new jobs and new conveniences as a result of the enlarged horizons it opens up for plastics, it is stated.

Dr. Charles Allen Thomas, director of Monsanto Central Research Laboratories, describes "Cerex" as "a thermoplastic, readily moldable in standard molding machines, and combining high resistance to heat with resistance to strong, corrosive chemicals, excellent electrical insulating properties, and high rigidity and strength."

• ELECTED PRESIDENT

Mark Z. McGill, Assistant Treasurer of Collins and Aikman Corp., Philadelphia, Pa., has been elected President of the Philadelphia Control of the Controllers Institute of America for the fiscal year 1944-1945.

• NEOPRENE PLANT CAPACITY TO BE INCREASED

Construction has begun on additions which will increase the neoprene plant capacity at Louisville, Ky., by fifty per cent, the Du Pont Company announced.

The government-owned plant, built and operated by the Du Pont Company, has been producing in excess of its rated capacity of 40,000 tons of neoprene synthetic rubber per year, it is stated. The expansion just authorized by the Defense Plant Corporation will bring the rated capacity up to 60,000 tons. Work on the new construction is expected to be completed by the end of 1944.

The War Production Board some months ago restricted the use of neoprene to products which could not be satisfactorily made of other materials. Because of neoprene's high resistance to the damaging effects of abrasion, sunlight, and oils, as well as its flame-retarding property, it is being widely used for jacketing electric wires and cables, on power transmission lines, shipboard cables, airplane wiring, field telephone lines, and drop cords and extension cables in war plants. It is also in great demand for a wide variety of other military applications.

Construction of the Louisville plant started June 2, 1941, and the first unit went into operation October 1, 1942. By August 22, 1943, all four units were in operation.

The neoprene plant units already completed at Louisville have been described by the Office of the Rubber Director as "among the most successful parts of the entire rubber program."

• CHANGE OF NAME

The name of the Collins Loom Works of Amsterdam, N. Y., has been changed to Aveco, Inc., it was announced recently. The company is a subsidiary of the American Viscose Corporation, which was acquired in 1943 for the purpose of carrying on research and development work in connection with tricot manufacturing technique.

• JOINS S. STROOCK & CO.

As an important part of its program to meet postwar requirements for new types of apparel fabrics for both men and women, S. Stroock & Co., Inc., woolen manufacturers, announce the establishment of a new Department of Research headed by Dr. A. C. Whitford, one of the world's outstanding fiber technologists. Dr. Whitford, who is just completing a scientific study of animal hairs for Yale University, joined the company in June.

Dr. Whitford and his staff will occupy a newly completed laboratory adjacent to the Stroock Mills in Newburgh, New York, where far-reaching experiments will be conducted into the structural properties and potentialities of all natural fibers. Special attention will be directed toward the development of new textures and finishes in fabrics made of the rare fleeces and hairs of the vicuna, llama, alpaca, camel, and kashmir and angora goat, in the processing of which the Stroock Company has specialized for the past fifty years.

• ANNUAL MEETING I. R. I.

Eighty-five industrial research executives and their guests attended the Sixth Annual Meeting of the Industrial Research Institute held on Friday and Saturday, May 19 and 20, at the Roosevelt Hotel, Pittsburgh, Pa.

Harold K. Work, Manager, Research and Development, Jones and Laughlin Steel Corporation, Pittsburgh, was elected Chairman of the Institute for the ensuing year, and John M. McIlvain, Administrative Supervisor, Research & Development Department, The Atlantic Refining Company, Philadelphia, was elected Vice Chairman. Charles S. Venable, Director of Chemical Research, American Viscose Corporation, Marcus Hook, Pa., and Harry M. Williams, Vice President, The National Cash Register Company, Dayton, Ohio, were elected to the Executive Committee.

The Industrial Research Institute, an affiliate of the National Research Council, undertakes to promote improvement of methods and more economical and effective management in industrial research through the cooperative efforts of its members. The sixty-six member companies are represented by their key executives in charge of research. Other members of the Executive Committee, in addition to those previously mentioned, are: A. G. Ashcroft, Product Engineer, Alexander Smith & Sons Carpet Company, Yonkers, N. Y.; R. T. K. Cornwell, Director of Research, Sylvania Industrial Corporation, Fredericksburg, Va.; W. R. Hainsworth, Vice President, Servel, Inc., New York; and Maurice Holland, representing the Division of Engineering and Industrial Research, National Research Council, Washington.

• NEW TRADE NAME

Pittsburgh Plate Glass Company, Columbia Chemical Division, Barberton, Ohio, announces the selection of the trade name "Allymer" for the complete line of Allyl Resin Monomers formerly known as Columbia Resins and designated as C.R. 39, etc. The numbers such as 39 and 149 will be continued to designate types.

• NEW TESTING PRICE LIST

The United States Testing Company, Inc., has published, and is now distributing to its clients, a booklet entitled, "Testing Price List." The booklet features specific test charges for textiles, chemicals, metals, foods and numerous other materials.

The Testing Company published its first

general price list many years ago and the many subsequent revisions speak well of the usefulness of such price lists. This new Testing Price List presents, in a compact form, the broadening in scope of the Testing Company's work in recent years.

• NEW LUBRICANT

Kilcommons Chemicals Corporation of 511 Westminster Street, Providence, R. I., announce a new lubricant for water soluble paste type pigment printing colors, which is known as "Lubricant D-6 Concentrate." It is said to be suitable for mixing with other types of colors, except Indigosols, and does not affect washing or crocking fastness.

Heretofore, say the manufacturers, it has been common practice to stop printing machines every 2400 to 3000 yards in order to clean the doctor blades. Lubricant D-6 Concentrate makes such frequent stops unnecessary. The minimum continuous yardage that has been run, using this lubricant and before cleaning the blades, is 15,000 yards, while the maximum is 33,000 yards, it is stated. This is an increase in continuous yardage of 600 to 1100 per cent and means a very important increase in over-all production as well as a big decrease in maintenance cost.

The manufacturers point out that this product was originally developed for a well-known textile printer in this country.

• MONSANTO PROMOTIONS

E. A. O'Neal, Jr., former plant manager of Monsanto's Trenton, Mich., plant, will make his new headquarters at Anniston, Ala., since succeeding John C. Brooks, as production manager of the Phosphate Division. James A. Wilson, assistant plant manager of the Trenton plant has been named plant manager, succeeding Mr. O'Neal.

• TRANSFERRED TO BUFFALO AREA

Ed. Crane has been appointed industrial sales engineer in the Buffalo area for the Brown Instrument Co., Philadelphia precision industrial instrument division of Minneapolis-Honeywell Regulator Co. Mr. Crane has been transferred from the New York City office. He will include the northwest section of New York State in his territory.

• NEW BASIC RESIN

The U. S. Stoneware Company announces the current availability for limited commercial and experimental use of a new basic resin having widespread immediate applications.

The new resin, named Duralon, a furane derivative, is characterized by the lowest water absorption of any organic resin, insolubility (after activation) in any solvent or combination of solvents, high electrical resistivity, absolute stability in storage and handling, and by ease of workability, it is stated.

• VICE PRESIDENT FIBERGLAS CORP.

Harry R. Winkle, Owens-Corning Fiberglas Corporation comptroller and treasurer, has been elected vice president.

Mr. Winkle will continue to serve as comptroller and treasurer, a post he has held since the Fiberglas Corporation was formed November 1, 1938. He has been associated with Owens-Corning and predecessor companies since 1923.

Mr. Winkle is a member of the board of directors of the Fiberglas Corporation whose general offices are in Toledo, Ohio, and is a member of the National Association of Cost Accountants. He is a native of Lima, Ohio.

• NEW BOOKLET ON CORN PRODUCTS

Many millions of bushels of corn, grown in our own Corn Belt, are milled annually to go into the production of war necessities. This is one of several little-known facts about corn that are brought out in a booklet, "Corn Facts and Figures," just published by the Corn Industries Research Foundation, 5 E. 45th St., New York 17, N. Y.

Such major industries as textiles, paper and paper products, metals, adhesives, fibreboard containers, and drugs and pharmaceuticals require more than 30 million bushels of corn a year in their operations, it is stated. A list is given of 500-odd uses of such products as corn starch, corn syrup, corn sugar, corn oil, etc., for industrial, food and livestock purposes.

The purpose of the publication, according to the Corn Industries Research Foundation, is to give an over-all picture of the importance of corn to American agriculture, marketing agencies, industries, and the war effort.

• ASSISTANT SALES MANAGER

James V. Donohoe, formerly of the New York office of the Mixing Equipment Company, has been promoted to assistant sales manager. On April 1, he assumed his duties at the Rochester home office.

• APPOINTED EASTERN SALES AGENTS

Amecco Chemicals, Inc., of Rochester, N. Y., recently announced the appointment of D. H. Litter Co., Inc., as Eastern sales agents for their chlorinated paraffins. The experience and background of the Litter organization in the protective coatings field and the facilities of their laboratory and technical staffs will be utilized in the development of markets for chlorinated paraffins. Amecco Chemicals, Inc., produces three types of chlorinated paraffins which are used as plasticizers and resins in fire retardant coatings and in special paints. These are Paroil 143, a non-volatile liquid with 43 per cent combined chlorine; Paroil 163, a soft solid resin with about 60 per cent combined chlorine; and Paroil 170, a hard resin with 70 per cent combined chlorine. The D. M. Litter Co., Inc., will handle Paroil sales from their offices in New York, Philadelphia and Boston.

• FLAME-RESISTANT NITROCELLULOSE COMPOSITION

The first step towards successful production of a practical flame-resistant nitrocellulose composition has been made in the Hercules Powder Company laboratories, according to a report made available to industry by the company's Cellulose Products Department.

The report describes the results obtained from varying the proportions of tricresyl phosphate and magnesium ammonium phosphate in a nitrocellulose formulation, and furnishes other technical information.

A good moldable flameproof plastic was obtained when the nitrocellulose: tricresyl phosphate ratio was held constant at 30:40 and the magnesium ammonium phosphate was varied from 30 to 60 parts.

A flame-resistant nitrocellulose composition has long been desired by industry and it is hoped that the results recently obtained in Hercules laboratories may aid in the solution of some practical problems which, when coupled with nitrocellulose's low cost, may have particular significance in postwar developments.

The company emphasizes that the data outlined is of a very preliminary nature and that it has been made available in order that the suggestions in it might be used as a basis for further experimental work in industries such as lacquer, plastics, coated textiles and similar industries.

• APPOINTED MEMBER OF A. S. A.

A. L. Gamble, Commissioner of Labor of South Carolina, has been appointed a member of the American Standards Association's Committee on the textile safety code.

The work of this committee covers safety requirements for plants which operate textile machinery and equipment, such as pickers, cards, combing machinery, drawing frames, roving frames, washing machines, mangles, winders, etc.

SANDOZ PRESENTS *The color achievement of the month*

Valiant Violet BY HADLEY

Even violet is a valiant color this year, as Fashion turns to the dyer's art for variety in the midst of wartime restrictions.

Sandoz congratulates the Cashmere Corporation of America, makers of Hadley Knitwear, for adding another fine sweater to America's informal wardrobe, for sports, cool summer evenings or winter twilights.

Subtle colors like Sandoz' Alizarine Light Violet 2RC and Brilliant Alizarine Light Violet FFR (Pat.) are contributing widely to the production of these fashionable shades on worsteds and woolens. Both colors have proved exceptionally fast-to-light.

In "thinking ahead with textiles", Sandoz has also developed certain Blues which, above all others, combine fastness to light *and* fulling. Brilliant Alizarine Milling Blues, BL, G and SL, will identify these colors on your order, should you wish to investigate these distinctive products of Sandoz' Research.

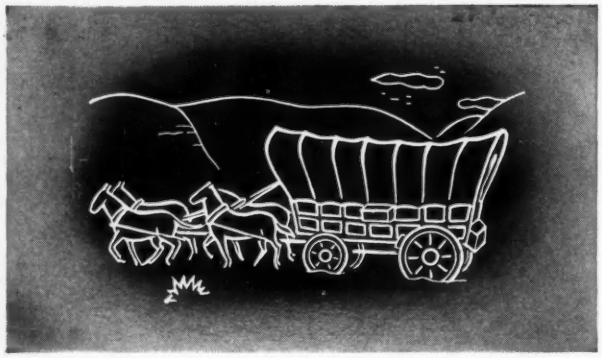
To assist you in filling your needs accurately, for a wide range of acid, chrome and direct dyes as well as auxiliary chemicals for all natural and synthetic fibres, Sandoz application laboratories are in New York, Boston, Philadelphia, Charlotte, Los Angeles and Toronto; stocks are carried in those cities. Other Sandoz branches: in Chicago, Paterson and Providence.

Sandoz, next month, will salute another of its customers among the leaders of the textile industry.

SANDOZ CHEMICAL WORKS, INC., 61 VAN DAM STREET, NEW YORK 13, N. Y.

SANDOZ *thinks ahead with textiles*

SANDOZ



PIONEERING

Over 60 years ago Zurnoil pioneered in the research, development and processing of products for scouring, stripping, penetrating, lubricating and finishing textiles. Many Zurnoil basic ideas have become common to the entire textile chemical industry but Zurnoil continuing research still pioneers in providing new, more efficient, more economical products. For your requirements, whether for improving existing methods or for solving problems in your processing of the new synthetics, Zurnoil friendly service and proved products are at your disposal.

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TEXTILE CHEMICALS

SCOUR "A"
Eliminates the use of soap
PENT LEV S. B.
Superior Penetrating Leveler
ALCOPHATE
(powder or paste)
Efficient Wetting Out, Penetrating and Leveling Agent

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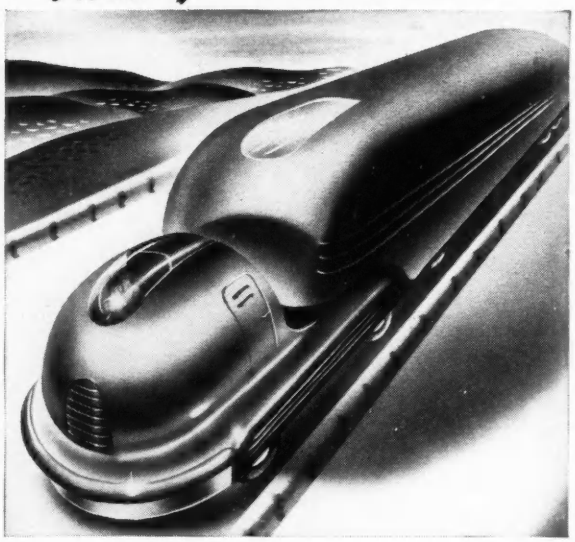
SOLVAY*

...KEYED TO TODAY AND TOMORROW



Today . . . Marvels of American mechanical science are relentlessly rolling over enemy territory. To meet the increasing needs of our fighting machines and fighting men, Solvay Alkalies and related products are making their special contribution to America's war production.

Tomorrow . . . The Solvay Process Company will answer industry's call for quality alkalies and related products. Solvay's broad technical knowledge and extensive research facilities will be united with industry. Together they will work for the advancement of industrial America and a better way of life.

SOLVAY
TRADE MARK REG. U. S. PAT. OFF.

**The Solvay Process Company employs salt, limestone and ammonia to make Soda Ash, from which basic material Caustic Soda and other alkalies are derived*

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AMMONIUM BICARBONATE
AMMONIUM CHLORIDE
PARA-DICHLOROBENZENE
CAUSTIC POTASH · CHLORINE · **CAUSTIC SODA**
POTASSIUM CARBONATE
SODIUM NITRITE · SALT
CALCIUM CHLORIDE
MODIFIED SODAS

SOLVAY SALES CORPORATION
Alkalies and Chemical Products Manufactured by The Solvay Process Company
40 RECTOR STREET NEW YORK 6, N. Y.

• Classified Advertisements •

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $6.25 per column inch or less per insertion.

WANTED: Experienced dyer, 30 to 40 years of age, for skein and package dyeing of silk, nylon, cotton, and other synthetic threads. Chemistry background and education important. Capable of handling men in dyehouse and supervising laboratory work. Plant in New England. Box 558.

POSITION WANTED: Textile chemist, over 15 years of practical experience with leading dyeing and finishing organizations as research-chemist desires connection with progressive organization. Experienced in formulating special finishes for the textile, metal and leather processing industries. Draft exempt. Box 563.

WANTED: By plant located in New England, graduate dye chemist familiar with dyeing all textiles. Must have successful record with broad experience. Permanent position with good opportunity. Salary commensurate with ability. State education and experience in detail. Box No. 568.

POSITION WANTED: Dyestuff representative, graduate chemist, foreign sales expert, interested in securing new connection for sale of dyestuffs and chemicals. Box 569.

WANTED: Textile chemist. Good opportunity in New England with large dyestuff manufacturer for chemist experienced in application of dyestuffs on union fabrics. Give draft status and full experience in first letter. Box 572.

WANTED: A demonstrator-salesman for the textile specialties with experience in the textile processing to represent an old established but progressive manufacturer. Advise age, experience and qualifications. Box 573.

WANTED: Chemist for large dyeing, printing and finishing plant located in New York area. Requests for interviews made by applicants should be accompanied by outline of their education and experience, salary desired and availability. Box 574.

POSITION WANTED: Experienced chemist seeks connection where he can direct or collaborate on the development of plastic or resin coatings and finishes. Box 575.

NOTE

Essential employees need release statement. Employees who are to be hired for critical occupations need release statement and U. S. E. S. consent.

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Expert formulae control is the result of sound pre-determined weighing. This requires top flight scales and EXACT WEIGHT Shadowgraph is that type of equipment . . . an industrial weighing unit designed and built expressly for the finest color blending operations in the industry. Not only do you get absolute accuracy but speed of operation as well. Illuminated dials rule out possibility of error in readings. Furnished to specifications of the operation required. Write for full details!

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HYDROXY* WATER-SHIELD
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—protect much of the fighting men's equipment from dampness and deterioration.

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Millions of yards of military fabrics have been treated with these products and approved by various Government departments.

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TEXTILE CHEMICALS

KALI MANUFACTURING CO.
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ARKANSAS Products

Serve Dependably

★

FUNGICIDE: A mildew proofer made in various types to meet all government specifications.

ARKO FIRE RETARDENT: For flame-proofing uniform cloth, felt and all types of rayon and cotton fabrics including theatrical drapes.

***AQUAROL:** A water repellent for uniforms, overcoatings and other military fabrics; also all civilian garment cloth.

***PARAMINE:** A cation active softener for processing cotton and rayon cloth to obtain a soft, smooth, pleasing fininsh.

***ALGEPON P.:** A retarding agent for vat and sulphur dyeing to prevent premature oxidation of the dye-stuff or in other processes when necessary to retard exhaustion to obtain a uniform shade.

***PARAPON S. A.:** A highly efficient leveller and softener used in dyeing and finishing all types of viscose and acetate rayon. Excellent for processing tricot cloth.

***CULOFIX:** Used as an after treatment in last rinse to prevent bleeding of direct dyed cotton or rayon in water.

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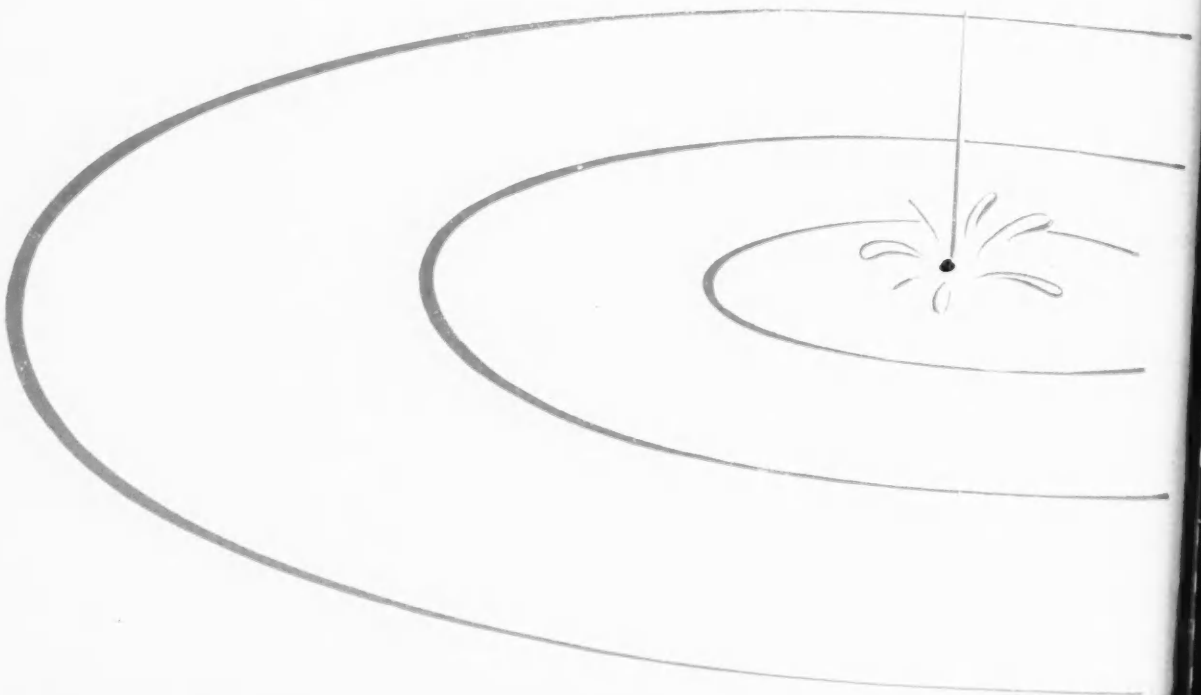

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